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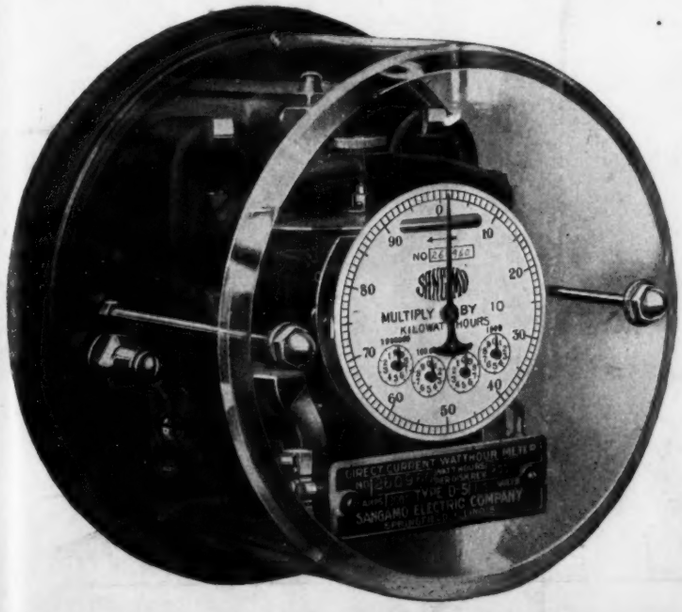

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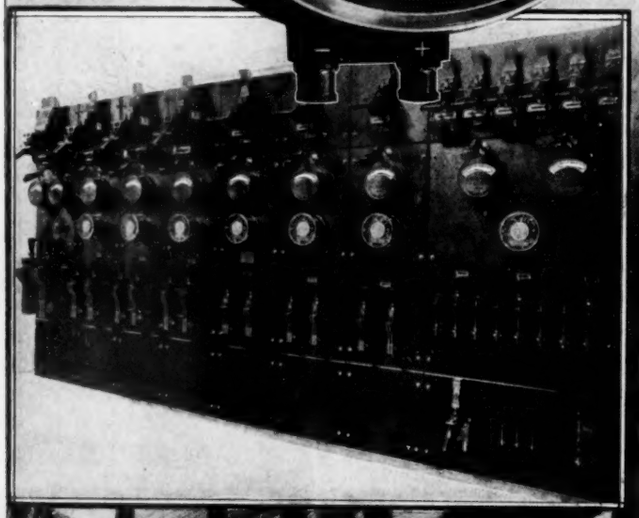

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Electrical World

The consolidation of ELECTRICAL WORLD, ELECTRICAL ENGINEER *and* AMERICAN ELECTRICIAN

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PUBLISHER'S NOTE

Owing to the unexpected prohibition of overtime by one of the printing trades in New York City this week, it has been necessary to cut down the number of pages in the present issue.

Geographic Section Expansion

THE geographic section movement is gaining impetus with President Ballard's swing around the country. Himself an ardent enthusiast on the question, based on his experience with the work of the Pacific Coast Section, others quickly catch his spirit. The feeling that the National Electric Light Association should concern itself chiefly with the larger questions of policy, leaving to the state associations and geographic sections the details involved in running the central-station business has been voiced before, but definite action has been wanting until now. A deterrent to the more rapid adoption of the idea is an unfounded notion that the geographic sections will preëmpt the work of state associations. Nothing is further from the fact, since it is freely admitted that the state associations are best fitted to handle most of the problems confronting the central-station industry. Politically, each state is a unit and each state has its own public service commission, not to mention a host of other conditions peculiar to individual states. Self-interest therefore dictates that the national association encourage the formation and perpetuity of state organizations, and every effort is being made by President Ballard in that direction. While many state associations are strong enough to be geographic sections, in a number of instances a geographic section would serve as a bulwark for a group of three or more state associations. Certainly it is very desirable to have the major work of the central-station industry performed by geographic or state sections, and for that reason we are pleased to note the warm reception accorded to President Ballard's proposals.

Training Arc Welders

ELECTRIC welding has come to be recognized as a very valuable art in the erection and repair of steel structures of many types. A good electric weld has great strength. It can also be made very quickly. A poor electric weld, on the other hand, may have very little strength and may be deceptive in its appearance. It is therefore important that the electric welder should be well trained and develop under supervision a high grade of skill before being employed on important constructive work.

O. H. Eschholz gives in this number the first of two interesting and important articles on the training of arc welders and apprentices. The training is of two kinds, namely, that which enables them to make sound and satisfactory welds in the work they undertake, and that which protects them from accidental injury from the intense light and heat of the arc, as well as from accidental electric shock due to careless handling of the conductors.

Who can determine the percentage coefficient of the human element in public utility operation? Surely it is of a high order, for the other and lesser part of the whole would be useless without individual vision, effort and experience.

The Design of Generating Stations

THE war has made radical changes in the economics of electrical generation. The cost of apparatus and conductors has increased, and labor expense has grown so rapidly that there can be little comparison with earlier conditions in the construction and operation of power plants. Louis R. Lee in the current issue gives a rather striking résumé of the designing problems brought about by these changes, with respect both to water power and to steam generating stations. As regards the former he does well to sound a note of warning against the expectation of extremely low costs. We have an enormous amount of unused water power in this country, a large part of which can be brought into action without inordinate expense, but in most cases only by exceptionally careful engineering and rigid economy both in construction and operation. The commonest source of difficulty found in hydroelectric works is failure to secure adequate data before starting construction. The difference between maximum and minimum flow is usually so very great as to produce frequent mistakes in estimating the real hydraulic situation. The period of maximum flow is on the average at a time when the yearly load curve is rapidly falling off toward its summer minimum, and the minimum flow in most streams, while also in summer, falls below the concurrent requirements. In addition, it not infrequently happens that there is a winter minimum as well, which catches the plant at the worst possible season. Storage as a rule is expensive and generally impracticable to obtain on a scale liberal enough to permit carrying through the dry season.

All these facts point to the necessity of very much more careful study of the hydraulic situation than has been the rule. Granted that a serious minimum must be dealt with, the question then arises as to whether it can be met by storage or requires the assistance of an

auxiliary plant; and this choice runs upon the conditions of load during the low-water season and the cost of power rendered available by steam plants. As Mr. Lee points out, there are two types of steam auxiliary, one for dealing with peak loads at certain limited periods of the year, the other for supplementary supply of power through a considerable portion of the season. The former can often be operated cheaply, the latter usually only at considerable expense, since the more a steam plant has to be used the greater the extent to which steam-generated power produced under rather unfavorable conditions must be furnished. Fortunately the steam-driven plant has been considerably improved in economy, so that it is not uncommon to find systems in which the water is auxiliary to the steam rather than the reverse. The line of these changes for the better in steam plants Mr. Lee very plainly indicates. The greatest economies, as we have time and again suggested, lie in the boiler room rather than at the turbines. The generators themselves cannot be much improved in efficiency; the turbines which drive them are now worked pretty close to the possible, considering the temperature range available. It is in increasing this temperature range and supplying the steam on an economic basis that the chief gains can be made. Big boilers, worked at maximum efficiency and delivering steam at the highest temperature the turbines can utilize, are the first requisite, whether the steam temperature is reached in virtue of boiler pressure or at high superheating. The exact economic relation between these two has not yet been fully determined, but recent plants are working steadily toward higher pressure with superheat enough to push the temperature toward the limit set by the endurance of the material.

In discussing the construction of very large generating stations obtaining coal at or near the mines Mr. Lee brings up a matter which is too often forgotten—the difficulty of securing the proper water supply from streams closely associated with coal mines, a fact which may sometimes lead to a plant location involving transportation of fuel under favorable circumstances. We quite agree that the future generating plant for a great city should be fairly well without its limits, on account both of cheaper real estate and better fuel supply. How great is the damage produced in many of our large cities by smoke it is hard to estimate, but directly and indirectly it is very large indeed. Only a small proportion of it is due to central-station operation, much more to manufacturing plants in which the use of electric motive power might make a vast change for the better. Were this combined with adequate supply of cheap fuel gas, so great a change might be made in urban conditions that the city of to-day with its thousands of smoking chimneys would scarcely be recognizable. A gigantic combination plant coking the coal, when a suitable supply is available, and furnishing its energy as the demands might best balance in the form of electricity, fuel gas and coke, is perhaps the ideal arrangement—one that may be realized sooner than any one now expects. The electrical supply of a great city from a point well outside it involves some special difficulties. These can, however, be overcome by modern methods of transmission. However this may turn out, we wish to lay special emphasis on Mr. Lee's demand for more economical building construction, the freer use of outdoor apparatus and, above all, the most careful scrutiny of boiler-room economies.

Standardization from the Industrial Viewpoint

WE RECOMMEND to our readers the views expressed last week in the article by E. E. George, who recommends standardization of machinery and apparatus from the purchaser's standpoint. In the case of new and recent developments it is of course impracticable to attempt standardization either in manufacture or in installation. In well-established lines of production, however, where experience has been secured through a number of years, it is most desirable to standardize all devices and to keep as few different sizes in demand as may be reasonably possible.

One can easily realize the confusion that would inevitably follow the adoption on a large scale of the opposite policy—namely, of installing a different and special make or size of apparatus for each new installation or requirement. Imagine the resulting delay and vexation in securing repair parts or duplicates.

Moreover, not only does the purchaser who standardizes his requirements aid his own business, but he also aids the large manufacturers, and through them the industry of the whole country. If each purchaser insists on ordering a special machine every time he makes a new installation, he virtually compels the factory that supplies him to depart from manufacturing and to take up jobbing on his account. Large-scale jobbing is as wasteful and detrimental to industry as large-scale manufacturing is economical and helpful.

Whatever the future management of our railroads may be, the cost of fuel is bound to force a more general adoption of electrical operation from interconnected steam and hydroelectric systems. It is none too early to bring the engineering economic computations up to date in scores of cases, through the coöperation of transportation and electrical utility executives.

Line Construction Under Difficulties

A PAPER by Lieut. Carl L. Raymond gives some valuable hints, derived from experience, on line construction under somewhat unusual conditions. The scene of operations was Florida, the line a 22,000-volt, three-phase transmission between the towns of St. Petersburg and Clearwater. In the first place the poles themselves, difficult to obtain in these days, were secured from cypress swamps within a radius of 50 miles (80 km.) by local contract and were set on the basis of about 34 per mile (50 m. apart). The question of right-of-way was rendered somewhat difficult by the fact that most of the property owners involved lived North. All the easements, however, were obtained by correspondence except two in which it was necessary to resort to condemnation proceedings. For a few miles the county highways were utilized. The construction was carried out by three gangs, one fitting poles, another digging the holes, and the third erecting by means of a gin wagon. The wire was strung subsequently, which enabled the camp equipment to serve both crews, and the right-of-way was cleared just ahead of the wire crew. The traveling camp equipment was extemporized out of three wagons like the old-fashioned prairie schooner, two for sleeping and one for the commissary service. Each sleeping wagon was fitted with eight bunks and the commissary wagon with cooking

equipment, ice chest and supplies. The gin wagon was equipped with an A-frame gin to lift the poles bodily, and the mules that drew the wagon also did the hoisting. Operating in this way, the line was put through quickly and with comparative ease, the only trouble met being in swampy ground where the poles were supported by keyboards spiked to their sides just below the surface of the ground to increase the bearing area. The poles were fitted with wishbone cross-arms and protected by an overhead galvanized-steel cable grounded to water every eighth pole. Two years of experience have shown no line troubles and proved the efficiency of the construction.

State of mind is one of the most important parts of utility operation. If it be destroyed or thrown into parallax, the result is bound to be manifest through the rank and file and every part of the organization.

European Power Plants

THE war has through its own tremendous activities brought the engineering world somewhat out of touch with the technical developments of peace, and our readers will therefore be interested in the article by Stephen A. Hayes on some features of present European power-plant practice, the first part of which was published on Sept. 6. In general terms, European plants are run on rather moderate voltage compared with the figures reached on our own long-distance plants. This difference naturally arises from the modest length of transmission line to be found in most European countries, although we recently noted a Spanish project in which at least 120,000 volts will probably be used. The most notable transmissions on the European continent proper are those in Switzerland and Italy. The former are, from the dimensions and topography of the country, of rather moderate length, but one or two of them are at extremely high head.

The Italian plants, to which Mr. Hayes especially refers, present some interesting features. Their periodicity is somewhat varied. Fifty cycles per second is the usual European standard, but the electrified State Railways in northern Italy work at 16⅔ cycles, three-phase, and the plant supplying Naples at 42 cycles, 60,000 volts. One of the plants supplying Rome, at Subiaco, is notable too as containing 3000-kw. Ganz generators delivering energy directly at 30,000 volts. At the receiving end of the line in Rome the distributing system is rather interesting. There are four groups, each consisting of about a dozen substations, all connected to the central control point of the group by pilot wires. At this point a clockwork device actuates the relays in the various substations in a definite sequence, and all the street lighting is controlled by the central regulating system.

The French transmission systems have been developed to the extent of considerably more than 1,000,000 hp., mostly in plants of no very great size. The biggest project in France is undoubtedly the supply of power to Paris from the Rhone near the Swiss frontier over a distance of nearly 300 miles (480 km.). The possible development here would be more than 300,000 hp. This proposal has been on foot for some years, and our readers will probably remember the discussion which took place regarding the comparative advantages of three-phase transmission and direct-current transmission on the Thury system. This latter proposition gave rise to very striking experiments some years since on the practicability of long direct-current cables and even on their use with ground return. It is rather remarkable that the outdoor substation has not yet found its way into European practice, although a few pieces of outdoor apparatus of American manufacture have been installed. The growth of outdoor practice now that the war has ended may be confidently expected.

Under government operation responsibility tends to get out of focus, and the pathway leads into such a network of interests, interferences and delays that it is next to impossible for the employee to get into that state of mind which counts so much toward efficiency in private management.

Penalizing for Low Power Factor

A GREAT deal has been said and written about charging large power customers on the basis of the power factor of their loads. One, and the usual, point of view is that the customer must pay his proportionate part of the cost of sustaining the total reactive kva. on the system. In accordance with this view complicated tariffs have been proposed and measuring instruments devised purported to give an equitable rate under any given condition. This reminds us of a judge who in fining automobilists made it a rule to impose a penalty of two dollars a mile over and above the legal limit. Another and less common point of view is that a low power factor is a nuisance, and a public nuisance at that, because it causes poor voltage regulation, demands bigger machinery and valuable space and has other drawbacks well known to electrical engineers. In accordance with this view it is not a matter of devising an accurate and complex rate formula which includes power factor, but of charging the customer separately for his reactive kva. and of charging him enough to make it worth his while to try to cut this down as much as possible. Using the foregoing comparison, it is not a matter of how much the overspeeding of an automobile or expectorating in a street car is worth to the community in damages, but a question of making the fine high enough to act as a deterrent.

If this point of view be adopted, the problem of rates is much simplified. Each large power customer is provided with two meters, one connected to measure the actual kilowatt-hours, the other to measure the reactive kilowatt-ampere-hours. The two meters may be identical, the difference being only in external connections. The customer is told that he will pay, say, 2 cents a unit on the first meter and 0.2 cent a unit on the second meter. He may further be told that his electrical engineer can not only reduce the second reading to zero (without putting a jumper around the meter), but may even make it run backward, and that credit would be given on the bill for negative readings.

Most customers, acting on competent advice, will carefully select their induction motors and transformers to keep their power factor as high as possible. A few larger customers will install synchronous apparatus and avoid the penalty or even earn a premium. The simplicity of the scheme has much in its favor, especially considering the fact that most customers are not versed in power-factor intricacies. The two-meter scheme need not begin say below 100 kw. of connected apparatus.

Training Arc Welders—I

Concise Course Intended to Familiarize Welders with Basic Characteristics and Operation of Bare Metallic Electrode Arc-Welding Processes—Exercises Are Outlined Which Aid Apprentice in Overcoming Difficulties in Manipulation

BY O. H. ESCHHOLZ
Research Engineer, Westinghouse Electric & Manufacturing Company

MANY industrial engineers are now facing the problem of developing competent welders. This situation is attributed to the rapid growth of the metallic electrode arc-welding field as the result of the successful application of the process to war emergencies. The operator's ability, it is now generally conceded, is the most important factor in the production of satisfactory welds. To facilitate the acquirement of the necessary skill and knowledge, the following training course considers in their proper sequence the fundamental characteristics and operations of the bare metallic electrode arc-welding process.

WELDING EQUIPMENT

Protection.—It is well known that the iron arc emits a large quantity of ultra-violet radiation. Protection from the direct rays is usually afforded by the use of hand shields. Many uncomfortable burns, however, have been traced to reflected radiation. To secure adequate protection from both direct and reflected light it is necessary for the welder to use a fiber hood equipped with suitable glasses. Paper No. 325 of the Bureau of Standards on "Spectroradiometric Investigation of the Transmission of Various Substances" concludes that the use of amber and blue glasses will absorb most of the ultra-violet as well as infra-red radiation. To protect the operator from incandescent particles expelled by the arc, closely woven clothing, a leather apron, gauntlets and bellows-tongued shoes should be worn.

If the welding booth is occupied by more than one welder, it will be found desirable to equip each operator with amber or green-colored goggles to reduce the intensity of accidental "flashes" from adjacent arcs after the welder has removed his hood.

Welding Booth.—The difficulty of maintaining an arc is greatly increased by the presence of strong air currents. To avoid the resulting arc instability, it is desirable to inclose the welder on at least three sides, with, however, sufficient ventilation provided so that the booth will remain clear from fumes. By painting the walls a dull or matte black the amount of arc radiant energy reflected is reduced.

The electrode supply and means of current control should be accessible to the operator. When using bare electrodes the positive lead should be firmly connected to a heavy steel or cast-iron plate, mounted about 20 in. (50 cm.) above the floor. This plate serves as the welding table.

Welding Systems.—Many commercial sets compel the operator to hold a short arc. This characteristic favors the production of good welds but increases the difficulty of maintaining the arc. By increasing the stability of the arc through the use either of covered electrodes, series inductances or increased circuit voltage and series resistance the acquisition of the purely manipulative skill may be accelerated.

Electrode Holder.—The holder should remain cool in service, shield the welding hand from the arc, facilitate the attachment and release of electrodes, while its weight, balance and the drag of the attached cable should not produce undue fatigue. A supply of different types of covered and bare electrodes should be carried by the welding school so that the operator may become familiar with their operating and fusing characteristics.

The degree of supervision the welder is to receive determines the source of operator material. If the welding operations are to be thoroughly supervised and the function of the welder is simply that of uniting suitably prepared surfaces, the candidate may be selected from the type of men who usually become proficient in skilled occupations. If, however, the responsibility of the entire welding procedure rests upon the operator, he should be drawn from members of such metal trades as machinist, boilermaker, blacksmith, oxy-acetylene welder, etc. Some employers find it expedient to use simple eye and muscular coordination tests to determine the candidate's ability to detect the colors encountered in welding and to develop an automatic control of the arc.

FIG. 1—CORRECT WELDING POSTURE AND EQUIPMENT

With adequate equipment provided, the operator may be instructed in the following subjects:

1. Manipulation of the arc.
2. Characteristics of the arc.
3. Characteristics of fusion.

4. Thermal characteristics.
5. Welding procedure.
6. Inspection.

ARC MANIPULATION

A sitting posture which aids in the control of the arc is shown in Fig. 1. It should be noted that by resting the left elbow on the left knee the communication of body movements to the welding hand is minimized, while by supporting the electrode holder with both hands the arc may be readily directed. During the first attempts to secure arc control covered electrodes may be used, as these greatly increase arc stability, permitting the welder readily to observe arc characteristics. It is suggested that throughout the training period the instructor give frequent demonstrations of the welding operations as well as occasionally guide the apprentice's welding arm.

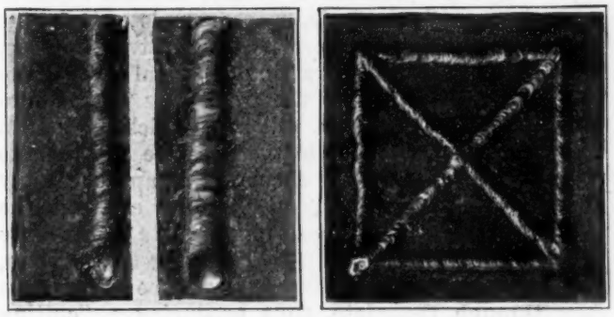


FIG. 2—EFFECT ON WIDTH OF DEPOSIT OF (A) NOT WEAVING AND (B) WEAVING ELECTRODE ACROSS DIRECTION OF DEPOSITED STRIP; FIG. 3—EXERCISE TO DEVELOP CONTROL OF ARC DIRECTION

These deposits were formed with the operator and plate in the same relative position, necessitating a change in the direction of arc travel for the deposition of each layer. Note that this direction is indicated by the position of the crater terminating each strip as well as by the inclination of the scalloped surface.

Arc Formation.—With the welding current adjusted to 100 amp. and a $\frac{5}{32}$-in. (4-mm.) covered electrode in the holder, the operator assumes the posture shown in Fig. 1 and lowers the electrode until contact is made with a mild-steel plate on the welding table, whereupon the electrode is withdrawn, forming an arc. If an insulating film covers either electrode surface or the current adjustment is too low, no arc will be drawn. With the arc obtained the operator should note the following characteristics of arc manipulation.

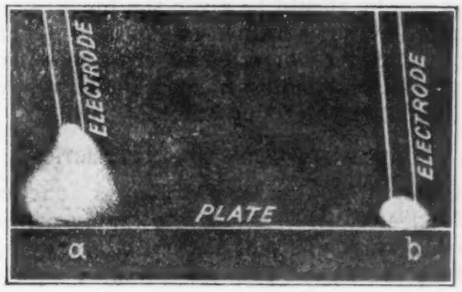
Fusion of Electrodes.—This is frequently called "sticking" or "freezing" of electrodes. It is the first difficulty encountered and is caused either by the use of an excessive welding current or by holding the electrodes in contact too long before drawing the arc. This fusing tendency is always present because the welding operation requires a current density high enough to melt the wire electrode at the arc terminal. When such fusion occurs the operator commits the natural error of attempting to pull the movable electrode from the plate. If he succeeds in separating the electrodes, the momentum acquired, unless he is very skillful, is sufficient to carry the electrode beyond a stable arc length. If, however, the wrist of the welding hand is turned sharply to the right or left, describing the arc of a circle having its center at the electrode end, the fused section is sheared and a large movement of the electrode holder produces an easily controllable separation of the arc terminals.

Maintenance of Arc.—After forming the arc the chief concern of the welder should be to maintain it until most of the electrode metal has been deposited. If the movable electrode were held rigidly, the arc would gradually lengthen as the electrode end melted off until the arc length had increased sufficiently to become unstable and interrupt the flow of current. To maintain a constant stable arc length it is necessary for the operator to advance the wire electrode toward the plate at a rate equal to that at which the metal is being deposited. For the novice this will prove quite difficult. However, if the initial attempts are made with covered electrodes, which permit greater arc-length variations than bare electrodes, the proper degree of skill is soon acquired.

When the operator succeeds in maintaining a short arc length for some time, the covered electrode should be replaced by a $\frac{5}{32}$-in. (4-mm.) diameter bare electrode, the welding current increased to 150 amp. or 175 amp. and either reactance included in the circuit or the voltage of the welding set increased. With increase in manipulative skill the reactance coil may be short-circuited or the supply voltage reduced to normal and practice continued under commercial circuit and electrode conditions.

Further instruction should not be given until the candidate is able to maintain a short arc during the entire period required to deposit the metal from a bare electrode 14 in. (33.5 cm.) long, $\frac{5}{32}$ in. (4 mm.) in diameter, on a clean plate $\frac{1}{2}$ in. (1.27 cm.) in thickness when using a welding current of 150 amp. The arc voltage may be used as a measure of the arc length. The average arc voltage during the test should be less than 25, as this corresponds to a length of approximately $\frac{1}{8}$ in. (3 mm.). Some operators meet this test in the first hour of their training, others require two or three days' practice. If arc-length control is not obtained within the latter period, the instructor may safely conclude that the apprentice is physically unfitted for the occupation of arc welding. If the test is satisfied, training should be continued, using bare electrodes but with such stabilizing means as inductance or resistance again inserted in the circuit.

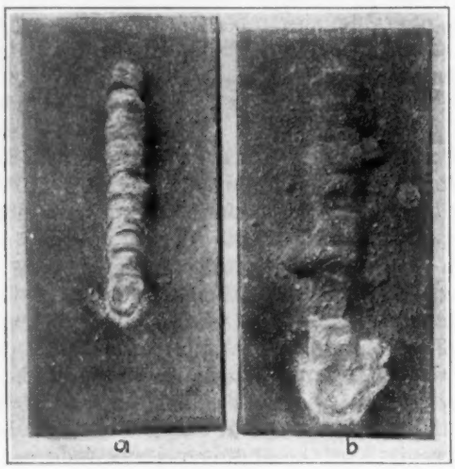
Control of Arc Travel; Direction and Speed.—The plate arc terminal and the deposited metal follow the direction taken by the pencil electrode. The difficulty of forming deposits varies with the direction. The first exercise should consist in forming a series of deposits in different directions, as shown in Fig. 3, until the operator develops the ability to form a series of straight, smooth-surfaced layers. Additional skill may be acquired by the practice of forming squares, circles and initials.



FIGS. 4A AND 4B—LONG AND SHORT WELDING ARC

Large arc stream causes excessive oxidation

The speed of arc travel determines the height of the deposit above the parent metal. A second exercise should require the formation of deposit strips having heights of $\frac{1}{16}$ in., $\frac{1}{8}$ in. and $\frac{3}{16}$ in. (1.6, 3.2 and 4.8 mm.). The normal height of a deposit when using



FIGS. 5A AND 5B—DEPOSITS OBTAINED WITH SHORT ARC AND LONG ARC

Note that surfaces of deposit and plate in (b) are heavily coated with iron oxide, while those in (a) are comparatively clean

a welding current of 150 amp. and a bare electrode of $\frac{5}{32}$ in. diameter is approximately $\frac{1}{8}$ in.

Weaving.—If the electrode end is made to describe the arc of a circle across the direction of deposit formation, the width of the deposit may be increased without changing the height of the deposit. This weaving movement also facilitates slag flotation and insures a more complete fusion of the deposited metal to the parent metal. Fig. 2 illustrates the appearance of deposits formed with and without weaving of the electrode.

A third exercise should consist in forming layers of equal heights, but having widths of $\frac{1}{4}$ in., $\frac{3}{8}$ in., $\frac{1}{2}$ in. and $\frac{3}{4}$ in. (6.3, 9.6, 13 and 18.9 mm.) when using an arc current of 150 amp. and a $\frac{5}{32}$-in. diameter bare electrode.

As the welder should now be able to control direction, height and width of deposits while maintaining a short arc, he should be given the fourth exercise of forming tiers of parallel, overlapping layers until inspection of the surface and cross-sections of the built-up material indicates good fusion of the metal as well as absence of slag and blowholes.

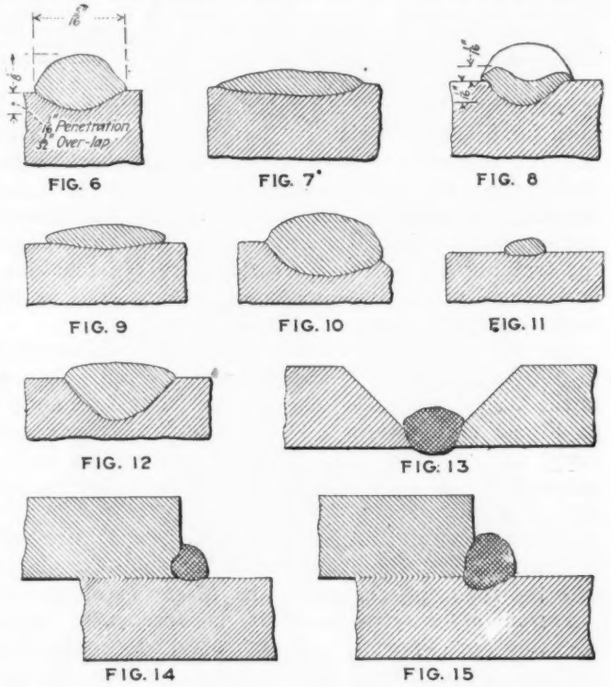
ARC AND FUSION CHARACTERISTICS

The arc is the welder's tool. Its function is to transform electrical energy into highly concentrated thermal energy. This concentrated energy serves to melt both the parent and the deposited metals at the electrode terminals, the arc conveying the liquefied pencil into the crater formed on the material to be welded.

Crater.—The plate arc terminal will always appear as a crater if a welding current is used. This crater is formed partly by the rapid volatilization of the liquefied material and partly by the expulsion of fluid metal due to the explosive expansion of occluded gases suddenly released or of gases formed by chemical reaction between electrode materials and atmospheric gases. To secure good fusion the deposited metal should be dropped into the crater. This is facilitated by the use of a short arc. On welding, the operator should frequently note the depth of arc crater and manipulate the arc so that the advancing edge of the crater is formed on the parent metal and not on the hot deposited metal.

Polarity.—When using bare electrodes the concentration of thermal energy is greater at the positive than at the negative terminal. Since in most welding applications the joint has a greater thermal capacity than the pencil electrode, more complete fusion is assured by making the former the positive electrode. The difference in concentration of thermal energy may be readily illustrated to the welder by having him draw an arc from a $\frac{1}{16}$-in. (1.6-mm.) thick plate with the plate first connected to the negative and then to the positive terminal. If a current of approximately 60 amp. is used with a $\frac{1}{16}$-in. diameter electrode, he will be able to form a deposit on the plate, if the plate is the negative terminal. On reversing the polarity, however, the energy concentration will be sufficient to melt through the plate, thus producing a "cutting arc."

Arc Stream.—This consists of a central core of electrically charged particles and an envelope of hot gases. The electrode material is conveyed in both



FIGS. 6 TO 15—OVERLAP AND PENETRATION STUDIES

(6) Typical section through a normal layer formed by depositing metal from a mild-steel electrode on a mild-steel plate. Note the contour of the deposit as well as that of the fused zone and the slight overlap and correct depth of deposit penetration. Parent-metal crystal structure is altered by thermal changes.
(7) Typical section through a deposit formed when holding a long arc. Excessive overlap and no penetration exist. Most weld failures may be attributed to the operator maintaining occasionally or continuously too long an arc.
(8) Section through crater formed on completing deposit strip. The depth of the crater is a measure of the depth of penetration.
(9) Excessive overlap secured with a pencil electrode (drill rod) having a lower melting temperature than the parent metal (mild steel).
(10) Elimination of overlap obtained by using a pencil electrode (mild steel) having a higher melting temperature than the parent metal (cast iron).
(11) Incomplete fusion obtained with a low arc current.
(12) "Cutting" secured through use of high arc current.
(13) Section indicates proper selection of welding current and electrode diameter to secure fusion.
(14) Poor fusion caused by too rapid flow of thermal energy from deposit through plates.
(15) Adequate fusion obtained by increasing arc terminal energy to compensate for increased rate of heat flow.

liquid and vapor form across the arc, a spray of small globules being discernible with some types of electrodes. Since atmospheric gases tend to diffuse through this incandescent metal stream, it is obvious that some of the conveyed material becomes oxidized.

Through the maintenance of a short arc, not exceeding ⅛ in., the resulting oxidation is a minimum because enveloping oxide of manganese vapor and carbon-dioxide gas, formed by the combination of atmospheric oxygen with the manganese and carbon liberated from the electrodes, serves as a barrier to restrict the further diffusion of atmospheric gases into the arc stream. Fig. 4 illustrates the degree of protection afforded the conveyed metal when using short and long arcs. With the latter convection currents deflect the protecting envelope from the arc stream. The effect of arc length on rate of oxidation may be

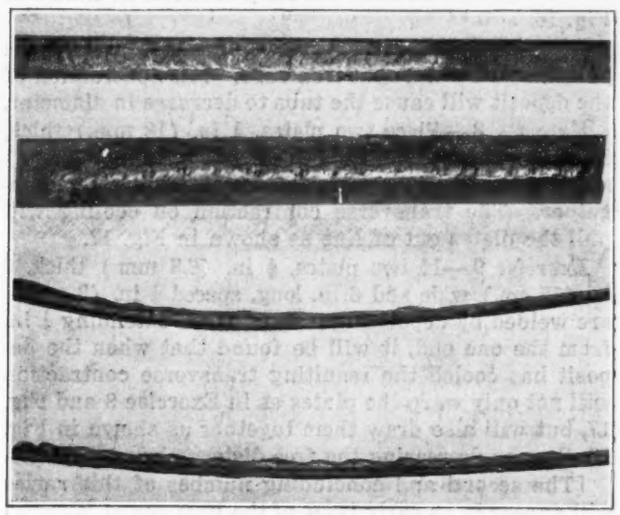


FIG. 16—WARPING OF THE PARENT METAL CAUSED BY THE TRANSVERSE CONTRACTION OF THE DEPOSITED LAYERS

clearly indicated to the welder by forming deposits with a ⅛-in. (3.2-m.) arc and a ⅜-in. (9.6-mm.) arc on a clean plate.

The surface of the first deposit will be clean and smooth, as shown in Fig. 5a. The surface of the second deposit will be irregular and covered with a heavy coating of iron oxide, as shown in Fig. 5b. All oxide formed during welding should be floated to the surface, since its presence in the weld will reduce the strength, ductility and resistance to fatigue of the joint.

Stability.—The ease of maintaining an arc is determined by the stabilizing characteristics of the electrical circuit and the arc gases. As noted above, increased stability may be obtained by the use of series inductance or higher circuit voltage with increased series resistance, higher arc currents and covered electrodes. A high-carbon-content electrode, such as a drill rod, gives a less stable arc than low-carbon content rods, owing apparently to the irregular formation of large volumes of arc-disturbing carbon-dioxide gas. Bare electrodes after long exposure to the atmosphere or immersion in weak acids will be found to "splutter" violently, increasing thereby the difficulty of arc manipulation. This "spluttering" is apparently caused by irregular evolution of hydrogen. If the electrode is coated with lime, its stability improves.

The evident purpose of a welding process is to secure fusion between the members welded. The factors that determine fusion in arc welding are arc current, electrode current density, thermal capacity of joint sections and melting temperatures of electrode and plate materials. By observing the contour of the surface of the deposited metal as well as the

FIG. 17—WARPING OF THE SIDES OF A WELD CAUSED BY THE LONGITUDINAL CONTRACTION OF THE DEPOSITED LAYERS

depth of the arc crater the welder may determine at once whether such conditions under his control as arc current, electrode current density and electrode material are properly adjusted to produce fusion.

The fifth exercise should consist of forming a series of deposits with arc currents of 100, 150 and 200 amp., using electrodes with and without coatings having different carbon and manganese content. Cross-sections of the deposits should then be polished and etched with a 10 per cent nitric-acid solution and the surface critically examined for such evident fusion characteristics as penetration and overlap, comparing these with the surface characteristics.

Overlap and Penetration.—Examination of the boundary line between the deposited and plate metals in Figs. 6 and 7 reveals that the penetration decreases in both directions from the center of the layer, no fusion being evident at the edges of the deposit, the contour betraying the extent of this overlap. As shown in Fig. 8, the penetration may be estimated from the crater depression.

An exaggerated overlap obtained in welding a mild-steel plate with a high-carbon-content steel rod having a lower melting point than the plate is shown in Fig. 9. The reëntrant angle of the deposit edge is plainly evident.

Fig. 10 illustrates a condition of no overlap in depositing metal from a mild-steel electrode upon a

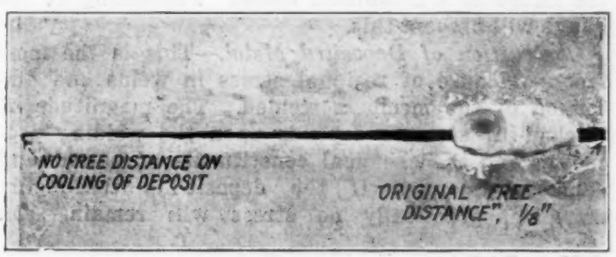


FIG. 18—REDUCTION OF "FREE DISTANCE" CAUSED BY TRANSVERSE CONTRACTION

Illustrates the necessity of rigidly clamping the joint members, or of assembling them by an increasing distance from the end to be first welded, to equalize the movement caused by the contraction of the deposited metal, if the desired "free distance" is to be maintained throughout the welding operation.

cast-iron plate having a lower melting point. Figs. 11 and 12 show respectively the effect of using too low and too high arc currents.

The effect of heat conductivity, heat-storage capacity, expansion and contraction of the parent metal and contraction of the hot-deposit metal must be studied.

Heat Conductivity and Capacity.—The effect of any of these factors is to increase the flow of thermal energy from the plate arc terminal and therefore to reduce the amount of metal liquefied. To maintain a given rate of welding speed it therefore becomes necessary to increase the arc current with increase in thickness or area of joint.

A welding current of 150 amp. will produce satisfactory penetration on welding the apex of scarfed plates ½ in. (13 mm.) thick shown in Fig. 13. If the joint is backed by a heavy steel plate, increasing thereby both its thermal capacity and conductivity, a higher current, in the neighborhood of 175 amp. to 200 amp., will be required for the same penetration. If a lap joint is made as in Fig. 14 and the same current used as in Fig. 13, the flow of heat will be so rapid that poor fusion will result. By increasing the current to 225 amp. (Fig. 15) the desired penetration, as indicated by crater depth, will be obtained with the maintenance of a high welding speed.

The fifth exercise should duplicate the examples shown in Figs. 13, 14 and 15.

Expansion and Contraction of Parent Metal.—The welding operation necessarily raises the temperature of the metal adjacent to the joint producing strains in the structure if it does not expand and contract freely. This condition is particularly marked when welding a crack in a large sheet or plate. The plate in the region of the welded section expands, the strains produced react on the cold metal at the end of the crack to open it further, with the result that as the welding proceeds the plate continues to open at a rate about equal to the welding speed. One inexperienced welder followed such an opening for 7 ft. (2.2 m.) before adopting preventive measures. The simplest of these is to drill a hole at the end of the crack and follow an intermittent welding procedure which will maintain the plate at a low temperature. Under exceptional conditions, such as welding cracks in heavy cast-iron plates or cylinders, it is advisable to preheat and anneal the regions stressed. A second example is offered by the warping obtained on building up the diameter of a flanged shaft. The face of the flange adjacent to the shaft becomes hotter than that opposite, producing internal stresses which warp the flange to a mushroom shape. Preheating of the flange will prevent this.

Contraction of Deposited Metal.—This is the most frequent cause of residual stress in welds and distortion of the members welded. The magnitude of "locked-in" stresses depends upon the welding procedure and the chemical constituents of parent and deposited metals. If the deposit is thoroughly annealed, practically no stress will remain. On adopting a welding sequence in which the joint is formed by running tiers of abutting layers, each newly applied layer will serve partially to anneal the metal in adjacent layers. If mild-steel plate, with less than 0.20 per cent carbon, is welded in this way, the locked-in stresses should be less than 5000 lb. per square inch (350 kg. per sq.cm.). With increase in carbon content the locked-in stresses will increase. If welded joints of high-carbon steels are not permitted to cool slowly, they will often fall apart when the joint is given a sharp blow.

To illustrate this characteristic, the following exercises are suggested:

Exercise 6.—Deposit a layer 1 ft. (0.3 m.) on a strip of steel about $\frac{3}{16}$ in. (4.2 mm.) thick, ½ in. (13 mm.) wide, using 150 amp. direct current and a $\frac{5}{32}$-in. (4-mm.) bare electrode. The longitudinal contraction of the deposit will bend the strip of metal as shown in Fig. 16.

Exercise 7.—Deposit a layer of metal around the periphery of a wrought-iron tube. The contraction of the deposit will cause the tube to decrease in diameter.

Exercise 8.—Place two plates, ½ in. (13 mm.) thick, 2 in. (5 cm.) wide, 6 in. (15 cm.) long, ⅛ in. (3 mm.) apart, and deposit a layer of metal joining them together. The transverse contraction on cooling will pull the plates out of line as shown in Fig. 17.

Exercise 9.—If two plates, ¼ in. (6.3 mm.) thick, 6 in. (15 cm.) wide and 6 in. long, spaced ⅛ in. (3 mm.), are welded by depositing a short layer extending ¼ in. from the one end, it will be found that when the deposit has cooled the resulting transverse contraction will not only warp the plates as in Exercise 8 and Fig. 17, but will also draw them together as shown in Fig. 18, thereby decreasing the free distance between plates.

[The second and concluding number of this series will appear in an early issue of the ELECTRICAL WORLD.]

PRIMARY POWER IN THE ARGENTINE REPUBLIC

Industrial Census of the Republic, Taken June 1914, Shows 305 Electrical Generating Systems Capitalized at More than $290,000,000

The results of the census of industries of the Argentine Republic, taken June 1, 1914, have recently been issued as volume 7 of the third national census. A chapter is devoted to motive power, and the accompanying table, obtained from the report, indicates the distribution of prime movers according to the source of energy as well as by industry. The total number of establishments engaged in the business of furnishing electricity is 305, with a capital of $290,353,114.

MOTIVE POWER EMPLOYED IN THE INDUSTRIES OF THE ARGENTINE REPUBLIC

Kinds of Industry	Steam		Electricity		Internal Combustion		Hydraulic		Animal		Total	
	No. Units	Hp.	No. Units	Hp.	No. Units	Hp.	No. Units	Hp.	No. Units	Hp.	No. Units	Hp.
Foods	1,952	106,648	3,420	34,865	1,888	18,869	190	4,379	16	25	7,466	164,786
Clothing	56	1,657	563	3,823	28	322	1	1	1	1	649	5,784
Building materials	767	29,729	1,453	10,949	520	3,369	7	520	2	3	2,749	44,570
Furniture, carriages and similar articles	185	2,437	905	4,736	287	1,841	2	10	2	2	1,381	9,026
Objects of art and ornaments	3	16	102	[illegible]	7	62	...	.....	..	..	112	442
Metallurgy and allied industries	195	6,25[illegible]	1,301	8,16[illegible]	411	3,151	6	356	1	4	1,914	17,935
Chemical products	89	2,252	240	2,251	25	348	5	64	..	..	359	4,915
Printing	20	234	727	2,498	37	316	..	.....	..	..	784	3,058
Textiles	65	4,980	279	3,475	28	1,633	2	115	..	..	374	10,203
Electric power	569	352,848	1	1	202	25,227	35	13,033	..	..	887	391,959
Other industries	157	11,004	1,022	13,663	52	1,174	8	233	1	5	1,240	26,079
Total	4,058	518,054	10,013	84,790	3,565	56,312	256	19,561	23	40	17,915	678,757

Present-Day Problems in Station Design

Outline of Conditions Which Demand in Future Plants, for Successful Commercial Operation, Radical Changes in Assembly and Engineering Economies in Locations, Buildings, Ratings and Auxiliaries

BY LOUIS R. LEL
Chief Engineer E. W. Clark & Company Management Corporation

IN THESE post-war days of high costs the efficiency from coal to kilowatts, or, better yet, the net return upon investment, must be employed as the yardstick in making necessary extensions and alterations and in the construction of new plants. These considerations must be extended to both water-power and steam plants.

Several factors that affect central-station operation have become more prominent than others in the last few years. Fuel costs more and is not always readily obtained; plant operators now look to mine ownership or large storage in order to insure continuity of service; prime movers are now to be had in huge capacities; they can be housed in a relatively small space and are highly efficient, but they put "a lot of eggs in one basket." Boilers, stokers and other equipment for the generation of steam have also come in for much improvement. In fact, in the desgin of the boiler room the engineer has more latitude than in other parts of the plant; likewise the operator has a greater opportunity to get results in the boiler room than he has anywhere else. The increased cost of fuel and labor has also increased interest in water-power developments and some intresting progress has been made in the development of automatic outdoor water-power stations.

NEW PRICE STANDARDS FIXED BY THE WAR

The war has created a new standard of prices for equipment and material required in plant construction, and it is very doubtful whether the old level of prices will ever return. To keep the unit cost down new designs must be produced. Building material must be used sparingly; moreover, the plans must allow low construction cost. Concrete forms must be simple and used over many times. Brickwork must permit of rapid construction and so on. Small savings will, therefore, be necessary to effect low over-all costs.

In this discussion the term "central station" includes the hydroelectric plant as well as the combination of water power and steam and the straight steam plant. Considering the source of power and its location, the following rough classification of generating stations may be made for studying the problems that are peculiar to each:

1. Water-power stations.
2. Water-power and steam stations combined.
3. Steam stations at coal mines.
4. Steam stations located out of cities—railroad and water governing location.
5. Steam stations located in cities—existing plants or load fixing location.

With regard to water-power stations, those who have actually built hydraulic stations have found by experience that the results are not always all that might be expected. Many have been disillusioned as to the so-called low cost of water power. The disappointments have usually been high first costs and decreased outputs. In other words, there have been a good many overdevelopments of water power. With few exceptions the rivers in this country have enormous high-water flow with very small low-water flow, a low-water flow occurring annually and an extremely low-water flow occurring in cycles of five to ten years. Since the flow of a river depends upon rainfall, the low flow follows no law whatever, and therefore the extreme low year may appear at any time, although over a period of ten to fifteen years there may not be more than the usual number of low years.

The first cost of water-power stations has usually been higher than estimated, owing to foundation troubles, cost of water rights and flooded property, which, of course, seems to be due to a lack of sufficient preliminary surveys or careful estimation. Foundations have often been found that were porous, allowing a large amount of leakage, which calls for a large expenditure to make the foundation tight. Faults are often encountered also which call for considerable work not anticipated. Therefore there are in operation to-day many water-power systems which have had to resort to steam generation. These auxiliary steam plants are located near the water-power stations, near coal mines or near the loads which are being supplied by the hydraulic systems.

Recent developments by the manufacturers of hydroelectric generating equipment have made it possible to make some quite extensive economies not only in the operation but in the first cost of water-power developments. Outdoor automatic or semi-automatic generating stations are also now possible and promise to be of a very practical nature. These features will do much toward making many comparatively small developments feasible and will have much importance from a conservation standpoint.

WATER POWER WITH STEAM AUXILIARY

The hydraulic-steam combination has been very successful in most cases, for in such instances the steam plant need not have the highest economy, as it only operates for short periods. Moreover, it is often possible to operate the steam station for these limited periods on a very high load factor, taking the peak loads on the hydraulic station, and in this manner make possible a very low steam generation cost. It is only where the steam stations have to continue to operate throughout the year on a standby basis that the hydraulic-steam combination produces an unsatisfactory result. Steam standby is extremely expensive and is especially so when boilers must be carried banked ready for service on short notice. Steam standby where the starting of a steam plant can be anticipated need not be especially expensive as in such cases the cost of fuel can be reduced to a minimum.

In locating a steam station there are three things which must be first considered. These are as follows: Fuel supply, railroad facilities and water supply. The

first two are so related to each other that they may be treated as one.

The increase in cost of fuel is due to higher wages and increased freight rates. It is, therefore, extremely important that the plant be so situated that the present fuel cost will be representative of what may be expected in the future. Since it is very doubtful that either labor or freight will be greatly reduced, with the probability that they may be increased, it is also important in locating the plant to ascertain the length of time that the present supply of coal has to run. In addition, it is important to have the plant so situated that there are several sources of supply and that strikes, mine disasters, railroad congestions, etc., cannot cut off the supply altogether at critical times. These perplexing problems have emphasized the advantage of locating a steam plant at the mine. In the case where the plant is built at the mine it, of course, only remains to insure by agreement or by ownership of the mine that the supply of coal cannot be diverted from the plant and to ascertain the extent of the coal in the mine, its quality and the probable cost of mining.

Water supply at the mine is usually of great importance because streams having their source in or near mines are generally unsatisfactory for power-station purposes and require expensive layouts for filtration and purification. Therefore the sites where plants can be built at mines with an unlimited supply of good water are rather scarce. The possibilities of locating plants at good water sites within relatively short distances of mines are probably greater, and such location may be considered extremely desirable. It is again important that electric transmission costs shall be materially under the cost of freight.

Suburban or Isolated Steam Station

Plant locations out of the city near railroad and water facilities will probably be the most common ones in the future. There are many very good locations under this class, such as those around the great lakes and at the intersection of railroads with large rivers. The difficulties of locating along rivers usually are poor foundation material and the great difference between high and low water. These features make plant foundations very expensive. Lake-front locations are desirable owing to the fact that foundations there usually are very good, there is little or no rise and fall in the water, and the water has a much lower temperature in the summer. However, lake-front location may call for a railroad extension or the building of docks for water transportation. A location just out of the city has many advantages, such as freedom from smoke ordin nces, the possibility of spreading the plant out over plenty of ground area, making the cost of buildings a minimum; the possibility of providing ample coal storage, and, in general, the possession of many liberties that would be denied, or would be impracticable because of cost, if a city location were chosen. There is usually an advantage of transmission with the out-of-the-city location; that is, power may be taken into the city over several different routes so that the cost of the distributing lines within the city itself is reduced. Moreover, the reliability of the service is greater, due to the fact that in case of fire or damage from storm the lines in one section may remain intact and continue to take care of the load requirements.

The question of high voltage has been a troublesome one, many municipalities objecting to high-voltage lines. This is due entirely to lack of education, and every effort should be made to educate the public and show it that high-voltage lines are no more dangerous than low-voltage lines, with the possibility that they are safer, as the high-voltage line carries less current, is usually better constructed, and owing to its smaller physical size has less liability of failure from storms. The writer believes there should be no limitation in voltage, that the only limitation on city lines should be the size of structures or number of conductors per structure, and that the lines should be so located as not to interfere with existing or future buildings or to interfere with the fighting of fires which may occur along the line. By a proper location of substations with underground trunk tie lines between them the incoming lines can usually stop near the city limits, or at least before reaching the business districts where high buildings must sooner or later exist.

Old Plant Sites

The location of the station in the city is usually determined by existing stations which have come to be generating and distributing centers. They are usually outgrowths of old stations, old equipment being displaced from time to time so that the investment in the station controls the location. These city plants have usually given extremely reliable service, and in many cases there is great hesitation to shut them down and bring in energy from outside sources. The best transmission line must give some trouble. Therefore any power delivered from outside the city is liable to interruption, and it is reasonable to expect that such service will be less continuous except where there are several sources from the outside, many lines bringing in power, and where the combined capacity of the lines and the source of supply greatly exceeds the demand. If the supply is sought from one outside source over one line, trouble is extremely liable to follow, and it would be unwise to make such a change in power supply except for a limited time while other arrangements are being made.

The city site for a plant must sooner or later be displaced. First, the value of real estate may become a burden on the plant. The lack of space for extension may cause the construction of the plant to be expensive and involve high operating costs. It may also enforce a small fuel storage and therefore make its fuel supply uncertain. There are too the questions of public convenience and pleasure to consider. The amount of smoke may be reduced, but no plant can be entirely smokeless. All plants must make noise to a greater or less degree, and at best the steam power station is an undesirable neighbor in residence, hotel or retail districts, or any district except those used for heavy manufacturing. One of the big arguments that the central station has in selling its power is cleanliness and convenience of application. Therefore the central station itself must be so situated as not to be an offender from a standpoint of smoke, dirt or noise.

Some recent developments have indicated that fuel oil may become quite a factor in the fuel-supply problem. Of course, fuel oil will be limited to certain localities, but the extent and number of these localities may be much greater than heretofore.

Substations must continue to be built in almost any part of the city. Usually they can be so constructed as not to be a nuisance. All substations are more or less noisy, but if the buildings are attractive and well in-

closed the noise may not be disturbing at even a short distance. Therefore, all things considered, it is well to expect that a great number, if not a majority, of steam stations will be located outside of the cities, either at convenient water and railroad intersections or near mining districts. Many of these plants will be known as "super-plants," that is, built in larger capacities than have been heretofore usually considered, supplying power to many districts or municipalities.

In the construction of these plants, all of which must have considerable capacities as compared with plants in former years, there are several features that must be kept in mind. First, it is going to be a big problem to keep the cost of electric power below a ready market price. At the present time it seems that the central plant has some advantage over the small plant owing to the cost of fuel, cost of wages and cost of equipment. This advantage may be only an apparent one if the central station is not able to keep its investment cost and operating cost somewhere near old-time or former figures. Fixed charges are bound to remain higher and possibly increase over those of former years, owing to the increased cost of money, taxes, insurance, etc. To offset these increasing fixed charges, the central-station operator must carefully watch his plans and estimates for extensions or new plants, to see that there are no unnecessary things included.

There is no excuse for elaborate or expensive buildings for a plant located in an out-of-the-way location, whether at the coal mine or in a suburban district. Plain, substantial fireproof buildings are not only sufficient but all that are justified. Buildings must also be of minimum size and preferably cover greater ground area rather than have high elevation. Since labor costs are bound to be high, great care must be exercised to see that the equipment is placed so that it is easily looked after, convenient and accessible for repairs and maintenance, and that there is a minimum amount of labor required.

The handling of fuel and ash, of course, is the large operation, and equipment must be installed for the handling of both coal and ash, the main concern being to see that this equipment does not require excessive maintenance. It must be possible at these modern "superplants" to deliver the coal by railroad cars and to take away the ash in railroad cars. There must be large coal storage facilities as well, so that the plant will be independent of weather conditions, freight congestion and extreme cases of seasonal disturbances caused by strikes and labor troubles.

Plants must be so constructed or planned that extensions may be readily made at costs comparable with original installation. The plans must be such that there will be no unnecessary first cost in order to care for future extensions. Because of the erratic growth of some localities and changes in the demand of different communities there is nothing so uncertain as the possible future demands; therefore, while it is necessary to provide in the plans for plant extensions, it very often happens that a given plant will not be extended in the future but may even be abandoned or moved to another location.

Economies in the Generating Station Layout

It should always be borne in mind that the one function of the generating station is to supply electrical enegy at the lowest possible cost. There should be no equipment provided or no buildings or architectural expense involved which does not work to this important end of producing at a minimum cost. Following modern successful practice, boiler-room equipment should be installed with the expectation of operating at its extreme capacity with sufficient economizer surface to reduce the exit gases to the lowest point, the limit being only the differential required between the ingoing feed water and the outgoing gas. Steam should be produced and delivered at the turbine at the highest allowable temperature. There is some open discussion as to the steam pressure which may be used, but there is little discussion as to the steam temperature. Boilers are apparently ahead of the turbine in this regard; that is, steam can be successfully produced at temperatures higher than is desirable for turbine construction at present. High-steam pressures have the effect of reducing sizes of steam lines, with consequent possible reduction in cost. But in any case the steam temperature must be as high as possible, which calls for the best heat insulation and the best grade of piping, valves and other fittings.

Quality Must Be Maintained

This is no time for a reduction in the quality of the plant equipment, but savings in the amount of piping required, the amount of material required for breechings and other plant parts of a like nature are not only justified but demanded in order to secure a plant for a minimum cost per kilowatt capacity. In the past there has always been more or less duplication of auxiliaries, piping for steam, water and other purposes, by-passes for gases, etc. In many instances this duplication of interconnections and by-pass arrangements has been proved to be not only a poor investment but unnecessary. In order to secure the minimum investment in the auxiliaries, for piping and the parts that go to make up a plant in addition to the main units of boilers, turbines, etc., it is believed that much can be accomplished along this line, especially in the boiler room, by making the boiler units as large as the size of the plant will warrant, by operating the boilers at high capacities, and by making the boiler, stoker, economizer and feed-water supply a unit with a minimum or no interconnection with other units in the boiler room. This will have the effect of simplifying the boiler room and making extensions feasible and at low cost. It will also have the effect of reducing the cost of operation, since operation covers both running costs and maintenance.

The future plant, however, must be provided with more indicating, recording and regulating equipment than it has had in the past. This equipment should not make the plant more complicated to operate as it might seem that it would do. It will provide the "telltale" to prevent poor results and also will reduce the amount of supervision required. The principal functions of this telltale equipment must be to provide an accurate account of fuel used, of steam produced and of temperatures of steam and water in the stages of the operation.

The modern stoker has shown that it has great capacity for handling all grades of coal with a minimum amount of change in its operation, but it has also shown that it is extremely susceptible to automatic or semiautomatic regulation, such as the control of the draft and the output of the boiler. There is much still to be accomplished along this line.

With the advent of high-pressure and high-temperature steam, it is most important to eliminate to a great extent, if not entirely, all steam-driven auxiliaries, op-

erating all auxiliaries by motors which secure their power by reliable connections to the main turbines where the power is generated at greatest efficiency. There is no reason for suspecting the unreliability of motor-driven auxiliaries. The central station owes its existence to a large extent to the sale of power for power purposes where the reliability of motor-driven equipment is very important and where it has proved extremely reliable. Therefore, a central-station operator will be inconsistent if he argues against the reliability of the motor-driven auxiliary in his own plant.

There will still remain two ways of heating the feed water to its desirable point, by using exhaust steam and by using the flue gas. The economizer must be used, but it operates more satisfactorily when water is supplied to it at a temperature of around 140 deg. Fahr. (45 deg. C.) It is considered good engineering to take a small quantity of steam from the main turbine at slightly above atmospheric pressure for heating the feed water. The supply of this steam can be regulated to a nicety so that the temperature of the feed water can be controlled at any desirable point. Further, the motor-driven auxiliary will have a lower maintenance cost than the steam-driven auxiliary. Its first cost may be less and it will require less attention from the operator. The most desirable motor, all things considered, probably is the three-phase, 440-volt, 60-cycle induction motor, either constant or multi-speed. Where necessary the motor may be totally inclosed at a reasonable increase in first cost.

With the object of making the station building of minimum size, considerable equipment can be installed out of doors, such as all transforming equipment for power and auxiliary purposes, also all high-tension line equipment. The electrical switching equipment installed indoors should be only that required for the low-voltage side of prime movers and transformers and for the motor-driven auxiliaries. All circulating-water facilities, such as gates, screens, etc., should be installed out of doors, and in many cases the circulating-water pumping equipment may also be entirely out of doors.

No doubt, in the future it will be found satisfactory and convenient to place the main turbines entirely out of doors, having some arrangement for making repairs during bad weather. A way may also be found to decrease the boiler-room building expense by placing everything but firing aisles out of doors. Stacks, induced-draft fans and economizers have all been successful when placed out of doors. There is little, if any, excuse for inside coal bunkers. The cheapest coal storage is ground area, using elevated bunkers only for purposes of filling distributing cars.

Extensions or new plants must be constructed when the load warrants increased capacity. It is foolish to wait for lower prices. The best equipment must be purchased, but it must be so assembled that it may be operated economically to its maximum safe capacity. Radical rearrangement of standard equipment will be necessary to accomplish large savings in first cost and operating expenses, and every economy possible must be accomplished in buildings, piping, interconnections and idle spare equipment, in order that the function of a steam or water-power plant, to generate energy at the lowest possible cost, may be realized.

Constructing a Line Under Difficulties

Right-of-Way Easements Secured by Correspondence—Poles Obtained from Cypress Swamps—Portable Camp—Special Corner Construction—Setting Poles in Muck Ponds—How Obstacles Were Overcome

BY CARL L. RAYMOND
First Lieutenant 306th Engineers, 81st Division, A. E. F.

IN BUILDING a transmission line from a central-station in St. Petersburg, Florida, to Clearwater to serve towns along the route and supplant a less economical station at Clearwater which formerly served the load, some methods were used that may be helpful to other engineers under similar conditions. The line, which was designed for 22,000 volts, three-phase, was supported on Thomas insulators and Bilsby steel wishbone cross-arms and protected by an overhead galvanized-steel strand grounded to water every eighth pole. Cypress poles were used throughout, except at substations, which were of the outdoor type, about thirty-four line poles being installed per mile. The location survey was made by the stadia method, which was sufficiently accurate for the purpose.

Securing the right-of-way was rather complicated by the fact that most of the forty or more property owners affected lived in Northern states. It was accomplished, however, at very little expense and without a great deal of delay by arranging for easements by correspondence. Only two could not be secured in this way, and in these cases it was necessary to resort to condemnation proceedings. For several miles it was found advisable to utilize the county highways, and the right to do so was obtained from the County Commissioner. The roads were well adapted to the purpose in hand because they run along section and quarter-section lines, which are of course straight.

It is interesting to note that no opposition was offered to the high-tension line passing through various towns, although, owing to technical ignorance or supposed technical knowledge, persons often raise objections to such lines, even though when properly constructed they are really less dangerous than the average 2300-volt installations. That no such protest was made speaks well for the progressiveness of the citizens along the route.

The poles, which were obtained from cypress swamps within a radius of 50 miles (80 km.) by contract, were provided after some delay owing to the failure of many of them to meet specifications.

The construction commenced in September with a crew of eighteen men. The crew was divided into three gangs—one framing the poles (which had been distributed as fast as received), putting on cross-arms, bayonets for the ground wire and insulators; the sec-

ond digging holes, and the third erecting poles, a gin wagon being used for this latter work. The wire was not strung until after the poles had all been erected, which enabled the use of a smaller camp than would otherwise have been required, the same equipment serving both crews. The right-of-way, which was practically free from underbrush, was cleared just ahead of the wire crew.

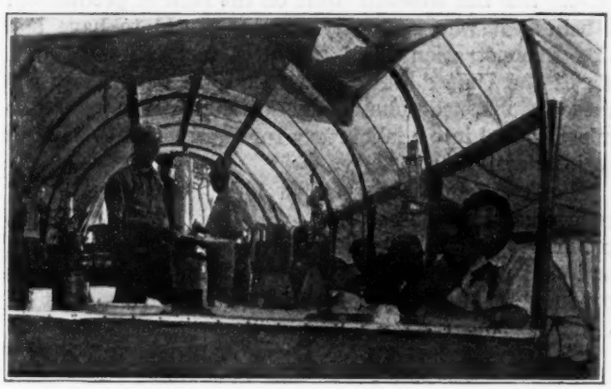


FIG. 1—INSIDE OF MESS AND COMMISSARY WAGON

The camp equipment was composed of three camp wagons fashioned after the prairie schooner, two for sleeping and one a combination cooking and dining wagon. The sleeping wagons consisted of enlarged wagon beds mounted on standard running gears extended, sheltered by heavy, waterproofed canvas stretched over light framework rounded on the top and supported by seven light stanchions and struts down the center of the wagon. This divided the sleeping space into eight individual bunks, each being equipped with a mattress. Ventilation was secured by fastening the canvas a few inches outward from the floor, all open spaces being covered with mosquito netting, including the ends of the wagons. The end netting was made in the form of flaps, allowing free passage.

The commissary wagon was built similarly but without center stanchions or struts, and the canvas on the sides was arranged to be raised outward for awnings. In the center of the wagon was an aisle on the sides of which were elevated platforms covered with oilcloth that served as tables. At meal time the men, drew up on the outside, sitting on light portable benches. At one end of the aisle, a little to one side to allow passing, was a woodburning cook stove, and at the other end was a built-in ice chest. The non-perishable commissary supplies were stored under the "tables." Considerable economy was effected by this portable camp as it was easily moved by three men and one team and the crews seldom had to walk more than a few hundred feet. The gin was of the hinged A-frame type, mounted on standard wagon running gear and designed to lift the poles bodily. A mule team was employed for the hoisting and motive power. The equipment gave entire satisfaction through the job, owing largely to Glen Parker, construction foreman.

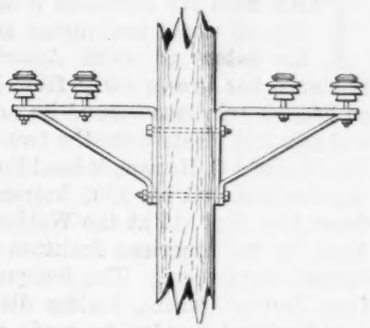
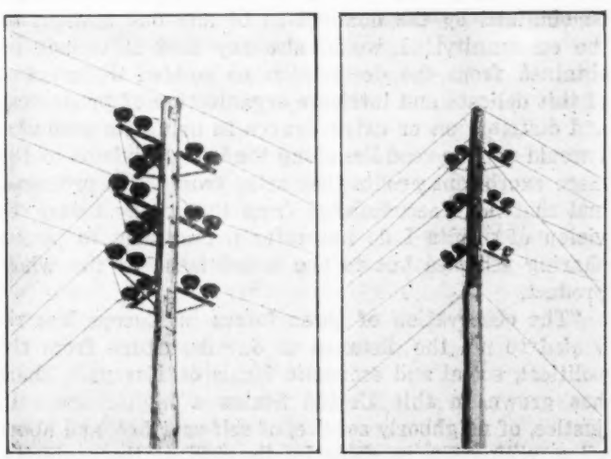


FIG. 4—METHOD OF SUPPORTING INSULATORS AT "TAP-OFFS"

A special corner construction was designed by the writer for use on heavy angles in the transmission line. This consisted of heavy iron brackets placed on the pole, one over the other, in line with the strain. Each carried two pin-type insulators, one behind the other, to which the conductors were dead-ended, the electrical connections being made with "jumpers." This type of construction was also used to great advantage on junction poles where it was desired to take a spur from the main line, and it can be heartily recommended for light construction as being efficient and cheap.

No undue trouble was encountered in the construction of the line except in the low, swampy land known locally as "muck ponds," through which it was necessary to drag the gin wagon by means of steel cable and blocks owing to the impossibility of piking the holes on the treacherous footing. In this ground poles were supported by keyboards, consisting of two 2-in. (5-cm.) planks spiked one on each side of the pole just below the surface of the ground and fastened together at the ends. Increasing the bearing area in this manner proved to be more effective than guying.

The line has been in operation more than two years, and G. W. Wilson, manager of the St. Petersburg and Clearwater properties, reports no trouble so far.



FIGS. 2 AND 3—CORNER CONSTRUCTION WITH AND WITHOUT PROVISION FOR TAP-OFF

FIG. 5—SOME OF THE PORTABLE CAMPS USED DURING THE WORK OF CONSTRUCTION

GREATER PRODUCTIVITY A WORLD ECONOMIC NECESSITY

Social and Political Ideals of America Are Different from Those of Europe, Says Herbert Hoover at Banquet Given in His Honor

THE need for increased productivity as a prevention of world bankruptcy and an appreciation of the extent to which America since its national existence has grown away from Europe in its outlook on life, its relations toward its neighbors and its social and political ideals were the two dominant impressions that Herbert C. Hoover, federal Food Administrator during the war, left his 1200 hearers at the banquet tendered him Sept. 16 at the Waldorf-Astoria Hotel, New York, by the American Institute of Mining and Metallurgical Engineers. The banquet marked his return from Europe, where, besides distributing food to the war-famished peoples, he made an extensive study of fundamental economic world conditions. The impressions imparted to his hearers by Mr. Hoover were those of an engineer who for many years has been recognized as being in the front rank of his profession.

"The enemy collapsed," said Mr. Hoover, "not only from military and naval defeat but from total economic exhaustion. In this race to economic chaos the European Allies were not far behind. In all this situation, with its desperation, greed, century-old animosities, its idealistic and proper aspirations, there was only one hope. That hope, expressed by every city and state, was that the American people would again intervene. The purpose of this second intervention was to find a large margin of foodstuffs and other supplies for the whole of Europe.

"This service of the American people has been accomplished at no mean national sacrifice. What the future has a right to demand from us in further economic support is not yet clear, but it is at least certain that if the world cannot quickly secure the settlement of peace and safeguards for the future through the League of Nations the whole of our two great interventions in Europe will have gone for nothing.

"During the period since the armistice we have witnessed social and political revolution among one-third of the civilized world, and we see the remainder in great social tribulation. Yet practical statesmanship requires that within our abilities a constant accounting should be taken of the tangible results of these forces abroad, if the development of our liberal institutions and progress of orderly government are to be maintained and revolution avoided.

"The economic impulse of the revolution to-day is the demand for a better division of the wealth from industrialism, and this time the agitation arises mainly from the urban populations. These vast masses of humanity in Europe have long been probing for the method of nearer equality of opportunity and better distribution of the results of industrial production.

"'We require only a superficial survey to see that the outstanding and startling economic phenomenon of Europe to-day is its demoralized industrial production. Of the 450,000,000 people in Europe, a rough estimate would indicate that there are at least 100,000,000 more than could be supported on the basis of production, which has never before reached so low an ebb. In a large degree the cause of this steady decrease of productivity must be sought in the social ferment, with its continuous imposition of socialist ideas. My conclusion is, therefore, that socialism as a philosophy of possible human application has already bankrupted itself.

"Although socialism has now proved itself with rivers of blood and suffering to be an economic and spiritual fallacy and has wrecked itself on the rock of production, I believe it was necessary for the world to have had this demonstration. It is not necessary, however, that we of the United States, now that we have witnessed these results, need plunge our own population into these miseries and into a laboratory for experiment in foreign social diseases.

"Bankruptcy of the socialist idea, however, does not relieve us from the necessity of finding a solution to the primary question which underlies all this discontent, and that primary question is the better division of the products of industry and the steady development of higher productivity.

AMERICANISM THE SOLUTION

"The paramount business of every American to-day is this business of finding a solution to these issues, but this solution must be found by Americans, in a practical American way, based upon American ideas, on American philosophy of life. A definite American substitute is needed for these disintegrating theories of Europe. It must be founded upon the fundamental fact that every section of this nation, the farmer, the industrial worker, the professional man, the employer, are all absolutely interdependent upon each other in this task of maximum production and the better distribution of its results. It must be founded upon the maximum exertion of every individual within his physical ability and upon the reduction of waste.

"The application of this proposition must, however, stand several tests. A maximum production can only be obtained under conditions that protect the physical and intellectual well being of the producer. If I were thinking aloud, I would say at once that this maximum production cannot be obtained without giving a voice in the administration of production to all sections of the community concerned in the problem; that it cannot be obtained by the domination of any one element of the community. I would also say that it cannot be obtained from the destruction or sudden disturbance of this delicate and intricate organization of production and distribution or extravagance in using its products. I would say the road lies along the better division of the more exorbitant profits that arise from these processes and that have accumulated from them. By better division of profits I do not refer particularly to profit-sharing schemes but to the broad issue of the whole product.

"The observation of these forces in Europe has revealed to me the distance of our departure from the political, social and economic ideals of Europe. There has grown in this United States a higher sense of justice, of neighborly service, of self-sacrifice, and above all a willingness to abide by the will of the majority, in every section of this community. This Americanism is the guarantee of the ability of our people to solve this most momentous internal problem confronting our generation. Our sister civilization in Europe is to-day recovering from a great illness. We alone have the economic and moral reserve with which to carry our neighbor back to strength. To do this is also true Americanism."

Readers' Views and Comments

A. I. E. E. Development Committee Report

To the Editor of the ELECTRICAL WORLD:

SIR: In the direction of increasing the value of the Institute publications and at the same time of meeting expenses connected with the broader progress desired, I would offer the following suggestions:

1. Abolish the monthly *Proceedings*. In lieu thereof:

2. Publish all technical papers in unbound form on cheap paper (like those of the American Electrochemical Society) and of letter size, 8½ in. by 11 in. Send out monthly to all members, in advance of presentation at meetings, and have copies available at the meetings. Let the Institute central office send out all copies coming under the present qualifications of "Institute papers," and let sections or branches similarly print and send to their own members or to the whole Institute membership originals or abstracts of all other papers that may be deemed of general value or interest.

3. Publish the "Institute Affairs" (now Section 1 of the *Proceedings*) as monthly bulletins, similarly but separately printed and mailed with the technical papers.

4. Publish an advertising "Bulletin of the Electrical Industry," printed in attractive form on calendered paper and of the above-mentioned size. Send this out with the technical papers and Institute bulletins.

5. Leave the publication of technical-literature digests, bibliographies, editorial expressions and articles foreign to the activities of the Institute (technical and committee) to the technical press. In this, with reference to digests, support *Science Abstracts*, in the publication of which the Institute is now a coöperator, and assist in increasing its breadth and utility.

6. Continue publication of the annual *Transactions* in substantial but not expensively bound form, printed from the plates of the technical papers and from those portions of the "Institute Affairs" that are of year-round interest.

7. Publish an annual "Catalog of the Electrical Industry" printed from such plates of the monthly advertising *Bulletin* as may be selected by the advertisers.

8. If the revenues from the two forms of advertising do not completely meet the increased cost of the broadened activities of the Institute, increase the dues of members and (or) exert moral pressure to induce members who are competent to raise their grades (hence dues) of membership.

Some of the reasons for these suggestions, as they appeal to the writer, are as follows:

With reference to Suggestion No. 2, separate pamphlets without bindings or covers are amply good for the principal immediate purposes for which the *Proceedings* are now published, and they have the advantage of being easily folded, for carrying for study in spare hours, and easily filed along with other technical data or in correspondence or "development" folders in which members may be interested. There is every reason of convenience why publications should be of letter size.

Suggestion No. 3 requires no particular explanation. A separate "Bulletin of Institute Affairs" might command a little more interest on the part of members and the public in the doings of the society and its officers and might serve for better contact with the public, because of its lacking the formidable technical appearance of the *Proceedings*.

In defense of Suggestion No. 4 it is the writer's belief that separate bulletins of electrical advertisements would command a great deal of respect from the members and would be very useful for filing in connection with purchasing activities. It would be a simple matter to save a few current advertising bulletins rather than the more bulky *Proceedings* and would be a convenience for engineering purchasing-department files. Advertisements in such a bulletin should bring in a large revenue to the Institute, especially if skillfully handled by a good advertising editor.

Suggestion No. 5 is offered in the belief that the A. I. E. E. should take no steps not consistent with its traditions as a learned society. The standing of the Institute among the profession is now very high, but it is very doubtful if this position could be maintained if it should enter a field substantially the same as that of the technical press. It is to be expected that leading engineering societies should maintain the character of their publications as superior in technical quality to the matter appearing in engineering magazines. There is a distinct field for each type of publication, that of the society being in the nature of studious discussion of engineering theory and practice, while the field of the technical magazine is more generally that of a newspaper and literary digest of the art. The latter is properly an activity of large organization and heavy expense. It should not be done half-way by a few underpaid editors and assistant secretaries.

With reference to the sixth suggestion it would certainly appear that if the papers of the Institute are not worthy of publication in books of annual *Transactions*, which could be available in the private libraries of engineers and in public libraries for all students of the art, they are not worthy of publication or even presentation at all. While the interest of a paper may be greatest at the time of its first publication, its value to engineers, inventors and other workers in the development of the art is more likely to be greatest during a serious after-study or in researches made years later than the publication. If the cost of publication and distribution of the annual *Transactions* of the Institute is a serious burden, why not let this load fall upon those (doubtless a majority of the membership) who really desire permanent volumes by making a difference of $5 in the cost of the membership as is done in the American Electrochemical Society? This would readily meet the requirement of such members as might be sufficiently interested, or find enough value in the monthly activities of the Institute, to pay dues therefor without incurring the expense of the annual volumes. So many engineers (and all technical libraries), however, find it worth while to preserve bound volumes of even their technical magazines that it is doubtful if there would be much reduction of demand for the *Transactions*.

The eighth suggestion is obvious, and it is the writer's firm belief that residual expenses could readily be met in the manner outlined. GEO. T. SOUTHGATE.

New York.

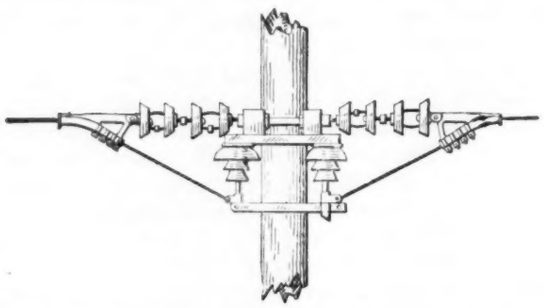
STATION & OPERATING PRACTICE

A Department Devoted to Problems of Installation, Operation and Maintenance of Equipment for Economical Generation and Distribution of Electrical Energy

SECTIONALIZING LINES BY DISCONNECTING SWITCHES

At Intervals of 5 to 10 Miles Switches Are Installed to Facilitate Trouble Hunting and Opening Lines for Repairs

A simple method of mounting disconnecting switches in 33,000-volt power lines as used by the Arkansas Light & Power Company, Pine Bluff, Ark., is shown in the accompanying drawings. The layout consists only of a double dead-end for each phase with an ordinary knife-type disconnecting switch mounted on a piece of channel iron beneath the cross-arm. Such an installation as this is made on the 33,000-volt lines every 5 miles (8 km.) or 10 miles (16 km.) at points of easy access. The switches are intended to be operated only when the line is dead. Their chief useful functions are sectionalizing the lines when men are looking for trouble or opening a section of a line when repairs need to be made on it.



POLE-TOP BRACKET THAT FURNISHED TWO-POINT SUPPORT FOR INSULATOR PIN

SAFEGUARDING PENSTOCKS AGAINST SUDDEN PRESSURES

French Plant at Soulom Employs Automatic Siphoning Apparatus as a Ready Means of Relieving Pressure

The piping which connects the starting chambers in hydroelectric plants is often subjected to extremely high pressures and also to the effects produced by water hammer, which latter increase the pressure still more. Rupture of such piping is by no means rare, and it may have grave consequences, as in such cases both the starting chamber and the supply channel may be emptied and the plant, located below, runs great danger of being swamped and destroyed. Therefore, it is advisable to provide some means of stopping the flow in case rupture of the piping occurs. One solution is that of operating the sluice by means of electric motors receiving their current from the plant itself, but this demands attention on the part of those employed at the station and does not therefore eliminate the human element. Apparatus invented by two French engineers and employed at the installation at Soulom has given excellent results. It consists of an automatic siphoning apparatus in which the priming is effected by means of a special water jet which at the critical moment aspirates the air from the siphon, preparing the pressure piping for the surge. The highest point of the siphon is above the maximum level of the reservoir, and a pipe equipped with a sluice valve connects the two branches of the siphon and serves to fill up the pressure piping. The latter is also fitted with a snuffle valve connected by another pipe to the peak of the siphon.

MARK MEREDITH.

Liverpool, England.

TRANSMISSION SYSTEM CHANGED FROM DELTA TO STAR

Engineers of Public Service Company Believe Less Trouble Will Result from Star Connection on Part of 33,000-Volt System

The 33,000-volt, 60-cycle lines connecting the large generating stations of the Public Service Company of Northern Illinois at Blue Island and Joliet with outlying parts of the system at Lacon, Streator, Pontiac, Kankakee, Maywood, etc., are being changed from the present delta connection to a grounded star-connected system. This decision to change was made after an engineering investigation which was necessitated by an unduly large number of cases of serious line trouble developing on the 33,000-volt system. In many cases this trouble was thought to be due to comparatively insignificant causes. In analyzing the line troubles covering a period of over a year the engineers concluded that the causes which produced thirty cases of trouble classified as "very serious" with the delta connection would have produced only two such cases with a grounded star connection; also that out of all the causes of line trouble experienced, only 17 per cent turned out to be "not serious," compared with a possible 62 per cent if the star system had been used. In brief, the investigation showed that the interruptions to service with the neutral of the transmission line grounded would be less than occur under present conditions with the system not grounded. It was also pointed out that with a grounded system the extent of the disturbance due to local trouble would be very much more limited because of better selective action of relays. Some of the chief advantages that the grounded star system offers as compared with the delta system are thought to be as follows:

Transformers are wound for only 57.7 per cent of the voltage required in the delta system and have 173 per cent of the current-carrying capacity of the delta-connected transformers. Therefore the fewer turns

of greater current-carrying capacity and the lower average voltage to ground of the transformers increase their reliability. Regarding the line, the maximum voltage on insulators in a star system is never above 57.7 per cent of the line voltage. Consequently less insulator trouble should be expected. As to operation, a phase ground is instantly detected and that portion of the line is automatically cut off before an extensive disturbance results in insulation breakdowns elsewhere.

The work involved in changing from delta to star connection in the substations and generating stations necessitates the installation of a third current transformer for relay operation wherever there is an automatic oil switch connected to a line. At present there are current transformers for this purpose in only two of the phases, but the star connection requires one on each phase wire for full protection. This work is necessarily slow and tedious, involving as it does certain changes in switchboard instrument wiring, waiting for suitable times to shut down equipment, limited space for the third current transformer, etc. According to present estimate, it will be about four months before all of the preparations are finished for a complete change-over to the grounded star system.

"HOLD-OFF CARD" SYSTEM ELIMINATES ACCIDENTS

Method Which Has Prevented Accidents to Men Working on High-Tension Apparatus in Large Water-Power Station

During the last four years, in which the "hold-off card" system for protecting men working on high-tension apparatus in the Holtwood plant of the Pennsylvania Water & Power Company has been in effect, not a single accident has occurred. The operation of this system is as follows:

If there is some work to be done on one of the generators, arrangements will have previously been made to take this generator out of service. When the man in charge of the work is ready to start he asks the operator to be "reported on" this particular machine. On a hold-off card are noted the name of the workman, the apparatus on which he is reported, the time reported on, the time when he expects to clear and a few brief remarks as to the work to be done. Attached to this card is a stub bearing the same serial number, the name of the workman, the apparatus on which he is reported and the time he is expected to be clear. This stub is given to the workman when he has been reported "on" and constitutes his permission to work on the machine. Assuming that the generator is already shut down, this hold-off card is attached to the generator oil-switch control button on the switchboard. A hold-off sign is placed on the floor in front of the generator disconnecting switches in such a manner that the door cannot be opened without first removing the sign. The generator leads are tested for potential with a switch hook and ground wire and then grounded. A hold-off sign is put on the generator field switch in such a manner that the switch cannot be closed without removing the sign. The turbine headgates are closed and a hold-off sign is placed on them. The turbine control is locked by a chain and padlock, the key for this padlock being held by the operator. The various hold-off signs which have been placed are noted on the back of the hold-off card. The stub of the hold-off card is then given to the foreman.

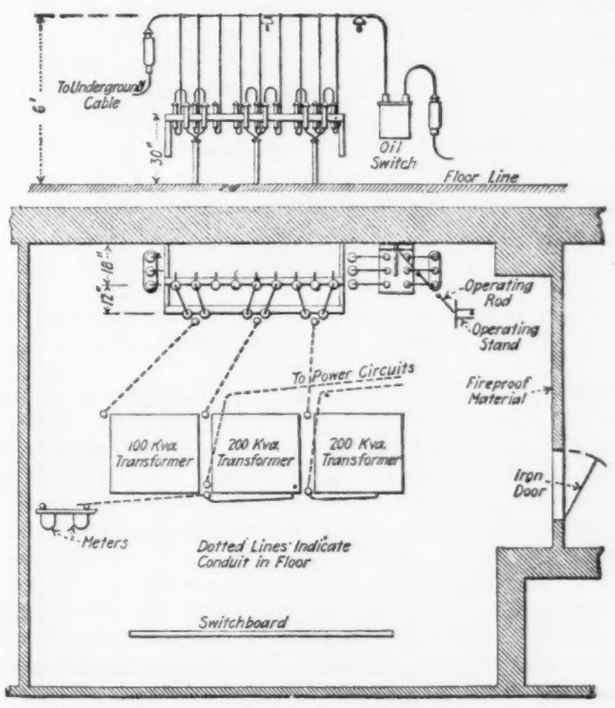
The foreman is responsible for the safety of all men working under him, and unless more than one gang is working on the machine simultaneously only one hold-off card is made out. When the workman is through with his work and everything is ready for operation as far as he is concerned, he signifies this by signing the stub and returning it to the operator, who then clears up the apparatus and returns it to service.

ALEX. BAUHAN,
Baltimore, Md. Superintendent of Stations.

DISCONNECTING POTHEADS TO ALLOW TRANSFORMER CHANGES

Makes Possible the Connection of Any Transformer to Any Phase of Either Feeder Circuit—Oil Switch Provides for Parallel Operation

To keep the load on the lines of the Sioux City (Iowa) Electric Company more nearly balanced, the Krehbiel Company, an engineering and constructing firm, has designed a substation which allows loads to be shifted from one phase to another. This was done by connecting the transformers to the main circuit by means of disconnecting potheads, which makes possible the connection of any transformer to any phase of either feed line. Furthermore, the oil switch provides for parallel operation of the circuits supplying the two sections of the main. Conduits run underneath the floor from



TRANSFORMERS CAN BE SHIFTED TO ANY LINE OR PHASE

the transformers respectively to potheads and then are extended vertically until they are near the pothead. Here the wires are connected to the bottom of the potheads, so that the disconnecting parts can be shifted at will. The transformers are installed in fireproof buildings with a doorway covered by an iron door which allows access to the room.

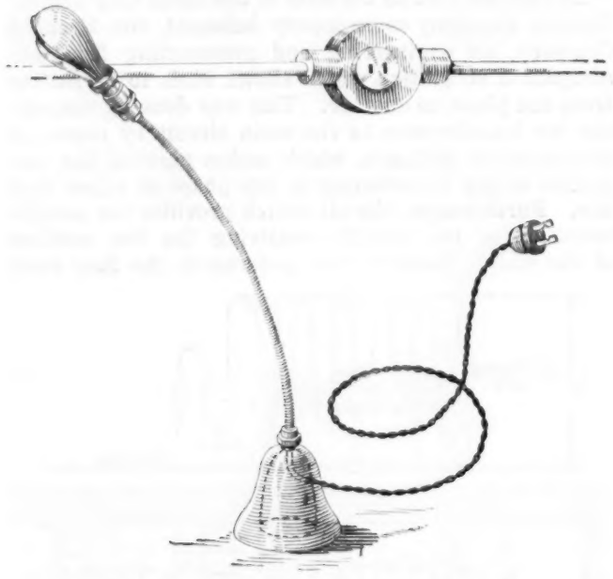
INDUSTRIAL APPLICATIONS

The Economical Utilization of Electrical Energy in Mills and Factories, Together with Practical Details of Installation, Control, Testing and Repair of Equipment Required

FLEXIBLE LIGHTING FOR USE WITH BENCH WORK

Portable Lamps with Weighted Bases and Flexible Arms May Be Attached by Plug Connector to Conduit Running Along Back of Bench

To provide a higher light intensity for its bench workers than is afforded by the general illumination the Singer Manufacturing Company, Bridgeport, Conn., has run conduit along the back of its benches to which special portable lamps may be tapped by plug connectors every 10 ft. (3 m.) or so. The plug receptacles are set in pipe taplets inserted in the conduit line. In general shape the portable lamps are similar to desk lamps now on the market having a weighted base and flexible arm to support the shade and lamp proper. However, the bases are made heavier for this particular installation so that the lamps will not be easily upset. The bases are shaped like a bell and are made of a hollow iron casting. Into the top of each is screwed a pipe tap holding a flexible spring-reinforced tubing which serves as the lamp and shade support as well as for concealing the lamp leads which enter the base at one side. Twin-conductor stage cord is used between the base and plug connector to withstand rough treatment which it may receive. Three to four feet (1 m. to 1.3 m.) of cord is sufficient for each lamp with the spacing of receptacles afforded, but some of the lamps have longer cords in order that they may be used at machines near the benches when extra illumination is desired. The machines not so located have receptacles near them for the connection of lamps, but local lighting is discouraged except where absolutely necessary, as on horizontal boring, fine work, etc. Carbon lamps are used instead of tungsten lamps because they are considered less fragile for the voltage used (220 volts).



SECTION OF CONDUIT CONTAINING PIPE TAPLET; GENERAL DESIGN OF PORTABLE LAMP

E. S. SMITH.
Bridgeport, Conn.

CARRIES PUMP LOAD AND CORRECTS POWER FACTOR

A 300-Kva. Synchronous Motor Used Continuously to Drive Deep-Well Pump and Correct Power Factor on Industrial Plant System

While the ordinary industrial motor is usually thought of as the most rugged of all electric motors, the operating record of a synchronous motor at the Omaha (Neb.) plant of the Cudahy Packing Company is of special interest. At that plant a synchronous motor operates a vertical American well pump for producing 2000 gal. (7570 l.) of water per minute against a head pressure above the ground of 75 lb. (5.25 kg. per sq. cm.). The water is pumped from 150 ft. (45 m.) below the ground. Adding the distance below the ground and the pressure above the ground it will be observed that the pump is operating against what really represents a 300-ft. (90-m.) head.

The pumping is all done by one 300-kva. vertical-type synchronous motor. On this load the motor pulls approximately 300 mechanical horsepower and in addition takes about 100 hp. surplus for power-factor correction, so that it is really operating at about full load. At this load the motor operates twenty-four hours a day the year round and has continued to do so for three years, with one exception of two weeks when the motor was down for overhauling. T. J. Byrnes, electrical engineer for the Cudahy Packing Company, has stated that the installation has proved satisfactory in every respect.

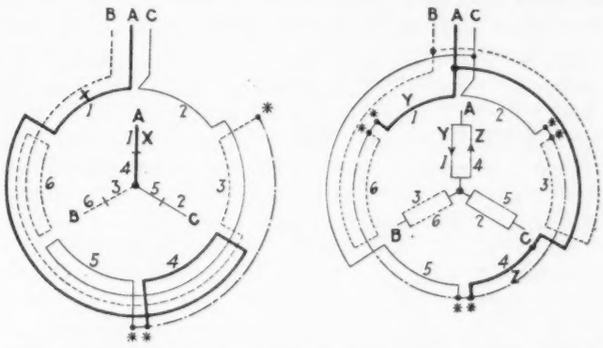
CUTTING OUT THE STATOR COILS OF INDUCTION MOTORS

Points to Consider in Cutting Out Burned Coils When Connected in Parallel Instead of in Series

W. B. Smith neglected to mention an important point in his article on the emergency repair of stator windings of induction motors in the Aug. 30 issue of the ELECTRICAL WORLD (page 472). His remarks only cover the case when the winding is single-circuit (series connection). If the winding is connected two or more circuits (parallel connection) and any coils are cut out of one circuit, it becomes necessary to cut the same number out of the other circuit. When coils are cut from one phase of a series connection it gives the same effect as if the voltage had been raised on that phase. This produces an unbalance which increases the heating and

decreases the power factor and efficiency. If not overloaded, however, the motor should operate indefinitely.

When coils are cut from one circuit of one phase of a parallel connection, the current will become unbalanced as in the first case, but to a greater extent owing to circulating currents in that phase. A motor in this condition will overheat when operated with no load and



FIGS. 1 AND 2—WINDING DIAGRAMS FOR A THREE-PHASE, SERIES, STAR CONNECTION SHOWING COILS CUT OUT AT *X*, AND A THREE-PHASE, PARALLEL, STAR CONNECTION SHOWING COILS CUT OUT AT *Y* AND *Z*

will certainly not run any length of time when carrying load. If Mr. Smith's motors are mostly 220-volt designs, he will probably find them all series connection and so should not have any trouble cutting out coils; but if he has some large 550-volt motors or if he should reconnect any of the 220-volt motors to operate on 550 volts, it would be necessary for him to proceed with extreme care in cutting out coils.

In Fig. 1 a three-phase series-star connection is shown. If coils are cut out of phase *A* as at *X*, the heating and unbalance will be due simply to the increased voltage across the remaining coils. In Fig. 2 a three-phase parallel-star connection is illustrated. If coils are cut out of phase *A* as at *X*, the heating and unbalance will be caused not only by the increased voltage effect but by the circulating current as indicated by the arrows. These circulating currents can be stopped by cutting out coils at *Z*.

RALPH MCKINNEY.

Berlin, N. H.

FILLING HOLES LEFT IN SLATE SWITCHBOARD PANELS

Method Employed for Filling Large and Small Holes, Replacing Chips and Protecting Screw Heads

In making alterations to switchboards all unused drillings in front or rear of slate should be filled with slate compound and dressed to a smooth surface. Small holes may be readily filled by using a piece of the compound and a hot soldering iron. In this operation smooth off the hole flush with the surface of the slate and rub down first with No. 1 sandpaper and then with No. 00 sandpaper. Then rub over both slate and compound with an oily cloth.

For large holes wooden plugs should first be placed in the drilling within $\frac{3}{8}$ in. (9.5 mm.) of each surface. Heat the slate with a blow torch or blast lamp and fill the holes over the plug with warm compound. Smooth off with a hot soldering iron and dress down as for small holes.

When it is necessary to replace a chip drill several small holes in the slate and even up the surface with slate compound and then smooth off. If holes are not drilled, it will be found difficult to make the compound hold to the slate.

A method of filling holes in slate panels which the writer has found satisfactory requires the use of a putty knife and a blow torch. It is found that by heating the knife the usual slate compounds may be worked into the hole and surfaced nearly flush with the slate. The patch is then completed by surfacing with a piece of pumice stone or sandstone dipped in water. The sandstone or pumice stone may also be used to eliminate superficial scratches.

All screw heads appearing on the front surface of switchboard panels connected so as to produce a potential of 100 volts or more above ground should be countersunk and the holes filled in with slate compound. Screws for fastening busbars together, for fastening busbars to ammeter shunts and for attaching terminal lugs with a single bolt should be equipped with washers.

H. E. WEIGHTMAN.

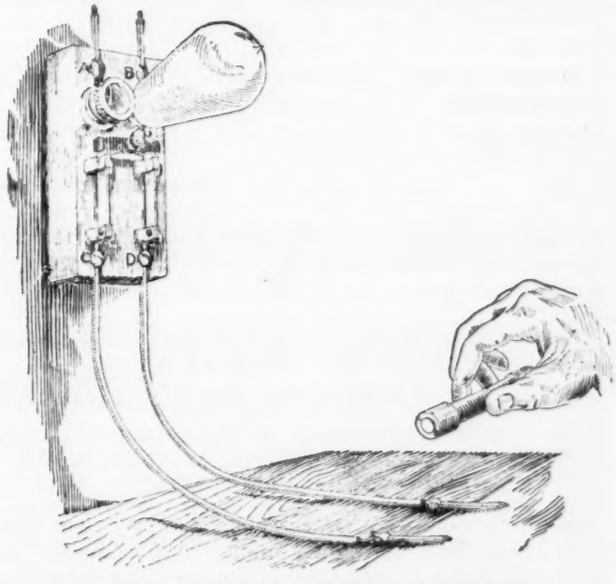
Chicago, Ill.

A CONVENIENT METHOD FOR USE IN TESTING FUSES

Fuse Block with Lamp in One Socket and Flexible Leads with Metal Points Can Be Used to Test Plug and Cartridge Fuses

A quick way of testing fuses, whether of plug or cartridge design, regardless of size, is shown in the accompanying sketch. A lamp is placed in one side of a main-line fuse block and a permanent fuse in the other. The line side *A-B* is connected to 110 volts. To *C* and *D* single wires of twisted lamp cord are connected with a wire nail soldered to each end.

The fuses to be tested are simply dumped on a bench. In the case of a plug fuse the shell is touched with one



FUSE-TESTING TERMINALS FOR USE ON A BENCH

nail and the tip with the other. In the case of cartridge fuses a nail is placed on each ferrule. When the lamp lights the fuse is good. The wires connected to *C* and *D* are made long enough to reach the bench but should not be much over 5 ft. (15 m.).

CENTRAL STATION SERVICE

A Department Devoted to Commercial Policy and Management Topics, Including Methods of Increasing the Use of Electric Light, Power and Heat

AROUSING INTEREST IN UNWIRED HOUSES

"Notice, Make Money," Proves Effective Advertisement in Getting Women to Canvass Neighborhood for Information

Here is an advertising plan which brought good results:

The Charlottesville & Albemarle Railway Company, Charlottesville, Va., printed an advertisement in the local press headed, "Notice, Make Money." It created a great deal of interest, and women in different parts of the city began at once to visit homes in order to make up lists of unwired houses. A week later the advertisement was changed. The new heading read, "Are You a Good Guesser?" It offered a prize of $5 to the one guessing the closest to the number of houses not using electric lights.

NOTICE, MAKE MONEY

While we have nearly 2,000 Electric Light Customers enjoying the benefits of electric service there are quite a few homes, white and colored, not having electric lights. For the person sending us the greatest number of names and addresses of homes without electric lights, before August 1st, 1919, we will give a prize of $5.00, and the person sending us the second greatest number of names and addresses we will give a prize of $2.50. It is worth your trying for.

C. & A. Rwy. Company

AN ADVERTISEMENT EVERYBODY READ

John L. Livers, vice-president and general manager of the company, says that several hundred names of occupants of unwired houses were obtained. He uses a map published by the Sanborn Company, Inc., which indicates all houses in the city.

SAYS EMPLOYEES' MORALE IMPROVES IN SOUTHWEST

Labor Situation Reviewed in Retrospect by A. V. Wynne—Causes and Remedies of Trouble Encountered During War

The practice among war industries of putting men into other than their own plants to hire away the most efficient workmen was only one of the nefarious developments caused by the labor shortage through which the country passed. This was pointed out by A. V. Wynne, St. Joseph (Mo.) Light, Heat & Power Company, in a talk at the recent convention of the Missouri public utilities on "Employees' Morale." Such underhand methods naturally were soon discovered by the men, and the unrest thus created was general. Part of the agitation arose through new men being hired to take the place of those who left for government service. The new men were inexperienced and needed much training, which the nucleus left of the old organization, with its high morale, could not spare the time to give. Some central stations carried extra men on their pay rolls to fill in unexpected vacancies. This experiment was partly successful in times of acute shortage.

At the present time many old central-station men want to return to their former companies. Those who have been enlisted men want better jobs than they had when they went to war. A few of those who have not been in government service but who were getting high wages in munitions plants are also returning. They are not satisfied for long, however, and are elements of uncertainty in the organization while they remain. The men on whom the employers must most seriously depend to change the spirit of the organization and to raise the morale of the employees are the returning army men who are ambitious to learn and to better themselves through work and study.

THE JUSTICE OF THE POWER-FACTOR RATE—III

Fairness of a Charge Generally Upheld, When Properly Evaluated and Justly Applied—Methods to Be Folltowed in Enforcing It

BY A. G. DARLING

Of the many meter schemes suggested and developed at the present time, a few are mentioned and briefly described below:

Integrating Ammeter.—This is probably the oldest type of kilovolt-ampere integrating meter; in fact, the original Edison chemical meter for lighting was of this type. In charging for power service, however, it is advisable to take voltage into consideration, either assumed or measured. The inaccuracy of assuming voltage or measuring it in any way except as a component of the power eliminates the integrating ammeter for most commercial purposes.

Integrating Kilovolt-Ampere Meter.—Many attempts have been made to secure such a meter for commercial use. Owing to its inherent characteristics, it is only possible (so far as the author is aware) to build a meter which is accurate for one value of power factor. By intricate methods meters have been developed for more than one value of power factor. Essentially these are single-unit meters so interconnected that each unit is fairly accurate for its individual value of power factor. When the value changes a second meter unit assumes the drive, relieving the first and all others. This function is characteristic of each of the various units. The expense of such an outfit is excessive for most commer

cial projects, though for certain very large loads and fairly constant power factor their value might not be a large item in the benefits secured.

A modification of this meter is that developed in England by Professor Arno, commonly known as the Ferraris type meoer. Professor Arno has made the suggestion that such a meter be arranged so that the total of its integrations be two-thirds true watts and one-third apparent watts. Other ratios of true to apparent watts may be adopted depending on the conditions it is desired to meet. To be accurate, however, the power factor of the load to be metered would have to be fairly constant.

Power-Factor Meters.—This type has been developed with high accuracy, both in the indicating and curve-drawing type, at a reasonable expense. The advantage of this type is that the result is expressed in the familiar term of power factor. Its disadvantage lies in its interpretation and application to the charge. The indicating instrument cannot be read frequently enough to arrive at a satisfactory result and at a cost commensurate with the result. The curve-drawing meter gives a successful record of the power factor, but difficulty arises in interpreting the curve, arriving at the result and applying it to the charge. If the power-factor limits are set for certain conditions of time, load or length of load values, the accuracy of interpreting the chart depends entirely upon the personal equation of the billing clerk. The length of the billing period, as, for instance, the basis of the month, brings in such a large opportunity for inaccuracy as almost to prohibit the adoption of this type of meter.

Wattless Factor Meter.—It has been proposed to use a meter which will measure the sine of the phase angle between current and voltage in percentage of the idle current component. Its result is independent of the quantity of load on the circuit and is the same as a power-factor meter except for the difference in scale marking. Its accuracy is commercial. However, the indications do not emphasize the detriment of low-power factor as well as the power-factor meter measuring the cosine of the angle.

Integrating Wattless Component or Reactive Kilovolt Ampere Meter.—This type of meter seems to be receiving recognition as the most suitable to use in most cases. Its name defines the unit of measurement, and it indicates the wattless component in the same manner as the watt-hour meter indicates the true energy. As it is virtually the latter meter, the development of it has reached as high a stage as the watt-hour meter. It differs from the watt-hour meter in the voltage connections being so made that the phase angle is 90 deg. out of the phase established in the watt-hour meter. It should be used in connection with the watt-hour meter. That is, the watt-hour meter measures power in terms of $EI \cos \phi$ and the reactive kilovolt-ampere-hour meter measures $EI \sin \phi$. Two ways of billing may be used:

First—On the basis of kilovolt-amperes, in which the result of the two meter readings is expressed by

$$\text{Kva.} = \sqrt{EI \cos \phi^2 + EI \sin \phi^2}.$$

Second—On the basis of a charge for kilowatt-hours plus a second charge for reactive kilovolt-ampere hours, in which the results of the two meter integrations are used separately. In many ways the latter method seems more practicable and easier of application, though the contract form has one more charge than is necessary with the first method.

By the addition of maximum-demand meters allowance may be made for true and apparent energy demands. By mechanically interconnecting the clock mechanisms the results will check.

In the application of these meters, the term "average power factor" should be used only as applicable to the element "time." The power factor of a customer's use for the billing period may be more accurately described as the "resultant power factor." This result is most easily obtained from the use of the watt-hour and reactive component meter.

In using the curve-drawing power-factor meter allowance must be made in the rate for the fact that the result of integrating, averaging or scanning the curve is only an approximation of the resultant power factor. If power-factor limits are used in the rate, the curve-

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The Opportunity in National Electric Light Association Study Courses

Form A

CENTRAL MAINE POWER COMPANY

Educational Courses of the National Electric Light Association

Training is Essential for Success

The Electric Utility business has and will offer exceptional opportunities for trained men. Your advancement will depend upon your knowledge of the business.

The Company makes the following offer to help you gain a better knowledge of the business.

The Company will **advance** your tuition fee to the Association, permitting you to repay it on the following monthly basis. The Company agrees to **refund** to you all of your tuition fee upon satisfactory completion of the course while in its employ.

	Tuition Fee.	Monthly Payment.
Course in Practical Electricity -	**$12.00**	**$2.00**
Commercial Engineering Course -	**$15.00**	**$2.00**
Elementary Accounting Course -	**$16.00**	**$2.00**
Advanced Accounting Course -	**$65.00**	**$5.00**

Make a profitable financial investment of your spare evenings

Mr. Freeman F. Burr, representing the Company and the Association, will give you special booklet on any course, advise with you and arrange for your enrollment.

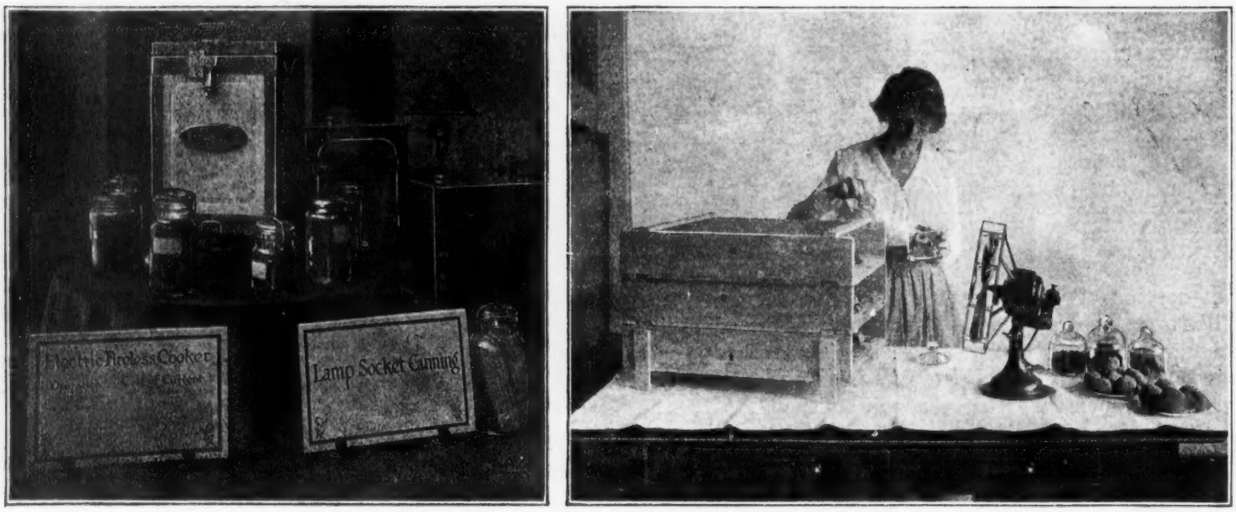
Courses open to all employees of this Company.

DO IT NOW—Prepare for the Reconstruction Period

The Central Maine Power Company, Augusta, Me., is making a definite appeal to its employees to take advantage of the study courses offered by the National Electric Light Association.

drawing meter will give the desired results. However, if a commercially accurate knowledge of the consumer's power factor is desired, with indications of the manner in which power is consumed, the combination of the usual watt-hour and demand meters with the reactive component and its demand meter will meet the demand.

Rates can be established on a kilovolt-ampere basis as well as upon a kilowatt basis, when it is considered that a kilovolt-ampere is simply a kilowatt at unity power factor. The advantage of establishing the kilovolt-ampere basis is then not very distinct and becomes questionable. In reality, those advocating it wish to simplify metering by the use of a single meter to take true and apparent energy into account at a reasonable cost, without calculations. Although this demand is a simple and apparently reasonable one, it may become extremely complicated when the customer, long accustomed to dealing with one unit—the kilowatt—is asked to consider his power cost on the basis of another unit which may have a vastly different value. An explanation will be due, and without the figures on the reactive component it may be difficult to convince him of the justice of the result.



USING ELECTRICITY FOR DOMESTIC CANNING AND DRYING

ELECTRICITY IS TRIED IN CANNING AND DRYING

Experiments by Home Economics Bureau of New York Edison Company for Department of Agriculture Include Study of Methods and Cost

For the benefit of those parts of the country where fuel is scarce and gas not available, the Department of Agriculture arranged with the New York Edison Company for a series of tests on the use of electricity for canning and drying. These experiments, which were carried out by the home economics bureau of the Edison company, included, besides a study of the best ways of preserving, the question of comparative cost.

The investigations have been completed and a detailed report has been made to O. H. Benson of the Department of Agriculture and will be published in a department bulletin later. Several interesting facts are brought out, apart from the culinary point of view. In the first series of tests an electric range was used in exactly the same way that one would use a gas stove. The material produced was excellent in quality, but the energy consumption was entirely too heavy to recommend this method to ordinary housewives.

A second series of tests was then carried out, using the oven of an electric range and obtaining the sterilization temperature by baking rather than boiling on top of the stove. This change of treatment produced good results and cut the energy consumption nearly in half, thus bringing it within the range of practicability. A further change, omitting the water bath usually employed for canning and placing the cans on a rack in the oven, was next tried, again effecting decreased energy consumption, making the cost for electricity only 4 cents for two jars.

Of interest to central stations in cities with considerable suburban population is the surprisingly good showing made by the electric fireless cooker as a device for canning. Employing the electric fireless cooker, the material is blanched and packed as usual, and the jars are placed within the fireless cooker and energy turned on full strength until the thermometer registers 180 deg. The energy is then switched off "high," 40 watts having been found sufficient to keep the jars at the sterilizing temperature. In this way the energy consumption is again reduced, the cost of the operation being only 2 cents.

Such a cost as this compares favorably with any other fuel and suggests the electric fireless cooker as a reasonable addition to the electric equipment of the ordinary city or suburban home where an electric range would not usually be available. In fact, from the housewife's standpoint, this method is really the most practical, since with the "fireless" a few jars at a time can be put up economically.

Drying of vegetables was also tried, using first the oven of an electric range, then a combination of range and electric fan, and finally the fan alone. The cheapest way is to make use of the residual heat left in the oven following some cooking operation. This is sufficient to start the drying process; then, when the oven is nearly cool, the door is opened and an ordinary electric fan is placed near by. This soon finishes the drying process and also prevents the oven from rusting Vegetables can also be dried by use of the fan alone, this process taking six and one-half hours at an average energy cost of 4½ cents.

DIGEST OF ELECTRICAL LITERATURE

Including Brief Abstracts of and References to Important Articles Appearing in the Scientific and Engineering Press of the World

Generation, Transmission and Distribution

Grounded Neutral on Alternating-Current Generators.—S. L. HENDERSON.—Advantages of grounding neutral in systems of large energy capacity and methods of protecting apparatus from disturbances.—*Electric Journal*, August, 1919.

Feed-Water Treating and Purifying Plant.—S. H. MCKEE.—The author describes what is said to be the largest treating plant exclusively used for boiler-feed water in the country. It supplies five works of the Republic Iron & Steel company at Youngstown, Ohio.—*Power Plant Engineering*, Aug. 15, 1919.

Hydraulic Conduit Velocity and Power.—DE SPARRE.—It is shown that the power developed may be increased by increasing the velocity of flow in the conduit until the ratio of the loss of head to the head available is 0.2.—*Science Abstracts, Section B*, June 1919. (Abstracted from *Comptes Rendus*, March 31, 1919.)

Electric Power Collection.—CHARLES P. STEINMETZ.—Dr. Steinmetz points out that barriers to further progress are sometimes met in rapidly advancing industries and in electrical engineering. The generation of electric power seems to have reached such a barrier. A motor is a comparatively small unit compared with the huge modern generator. The very size of generating plants has made them more complex, but many of the refinements of controlling and switching mechanisms might be dispensed with in a power unit no larger than a motor unit. The author proposes the use of small generator installations with simple switches and fuses to make use of our small water powers and thus conserve our fuel resources.—*General Electric Review*, August, 1919.

The General Principles of the Development and Storage of Water for Electrical Purposes.—J. W. MEARES.—The writer discusses the problem under the general headings as follows: The conditions requisite for water power, classification according to head, flow and storage, efficiency of hydroelectric plant, rainfall and run-off, evaporation and percolation, reservoirs, water storage and power, limitations of storage according to head, layout of hydroelectric scheme, headworks and clear water, canals and open channels, forebay reservoirs, pressure pipes and tailraces. Regarding efficiency of hydroelectric plants the author gives the following figures as the probable commercial over-all efficiency for plants of the size indicated: For 500 kw., 74 per cent; for 1000 kw., 76 per cent; for 1500 kw., 78 per cent; for 2000 kw., 80 per cent; for 3000 and over, 82 per cent.—*Journal of Electrical Engineers*, June, 1919.

Transmission Line from Nore Power Station, Norway.—The Norwegian Parliament has voted £110,000 for the Nore power station, which is to have an output of 100,000 kw. The project will be completed by 1924, and the question of the best type of transmission line is discussed. Eivind Hanssen, engineer for the works, points out the importance of arranging for the highest voltage which can be safely employed and recommends the adoption of the standard voltages now used for high-voltage lines in the United States, namely, 110,000, 132,000, 154,000, 176,000 and 220,000 volts. It is also pointed out that the initial difficulties with voltage up to 132,000 no longer exist, and that the latter can be used with the same degree of safety as the ordinary voltages, while the capacity is 40 per cent greater than if arranged for 100,000 volts. He strongly recommends the line to be connected to earth either by direct earthing, through an ohm resistance, or through a resistance coil as recommended by Professor Peterson of Darmstadt.—*Technical Supplement to Review of Foreign Press*, July 22, 1919. (Abstracted from *Teknisk Ukeblad*, June 18, 1919.)

Refinements in Turbine Design.—A. G. CHRISTIE.—The article deals with some of the things which are open to improvement, thus decreasing the steam consumption. Forms of throats and mouths of nozzles, polished surfaces for diaphragms and thickness of blade edges are among the things considered.—*Power*, Sept. 2, 1919.

Calculating Short-Circuit Currents in Networks.—W. R. WOODWARD.—It is necessary to estimate the effect of short circuits in various locations in systems of high energy capacity to insure the proper functioning of circuit breakers and relays. The author describes the method of using a miniature network in order to determine such short-circuit currents on a small scale.—*Electric Journal*, August, 1919.

Strength and Other Properties of Wire Rope.—J. H. GRIFFITH and J. G. BRAGG.—The paper presents the results of tensile tests upon 275 wire-rope specimens selected under the specifications of the Isthmian Canal Commission. The specimens ranged in diameter from ¼ in. to 3½ in. (6.3 mm. to 82.5 mm.) and comprised five of the more common classes used in engineering practice. The laws of construction of the specimens were determined and were used as the basis of the analysis of their physical behaviors under stress. Numerous comparative physical and chemical tests were presented of the wires, fibers and lubricants used in wire-rope construction.—*Technical Paper No. 121*, U. S. Bureau of Standards, July 16, 1919.

Some Problems in the Operation of Power Plants in Parallel.—E. C. STONE.—In order to operate two power plants satisfactorily in parallel, the transmission line which ties them together must have sufficient synchronizing power, as well as sufficient carrying capacity. The "synchronizing power" of a line depends upon its resistance and reactance, the bus voltages maintained at its ends and the maximum kilovolt-amperes it must transmit. The ability of different lines to provide satisfactory parallel operation cannot be measured by any standard which does not take account of all of these factors. Limiting values for "synchronizing power" of lines under various operating conditions are given.

The division of load between two plants in parallel is regulated by steam control; the division of wattless current associated with the load depends upon the voltages generated and may be in proportion to the division of real load, when the difference in voltage at the two buses will vary with the load transmitted or may be arbitrary so that regardless of the load transmitted the voltages on the two buses will be maintained constant. The latter plan generally gives better operating conditions on the system as a whole but creates demands for wattless currents at either or both plants in excess of their normal capacity, and in so doing involves an additional cost. The excess wattless cross-current so created can be materially reduced by varying the voltage with changes in load transmitted through the use of taps on the line transformers, by inserting additional reactance in the line at light load or when the stations are tied together by several parallel lines, or by cutting out one or more lines as the load decreases. The design of a transmission line involves a consideration of load to be transmitted, voltage, reactance, resistance, losses and charging current of the line, and of wattless generating capacity at the receiving end of the line. The wattless generating capacity at the end of the line determines how many kilowatts will be transmitted for each ampere of line current by fixing the power factor of the load transmitted and the voltage at the receiving end of the line. When a line is to be designed for paralleling two plants it must have sufficient "synchronizing power" to hold the two plants together.—*Proceedings A. I. E. E.*, August, 1919.

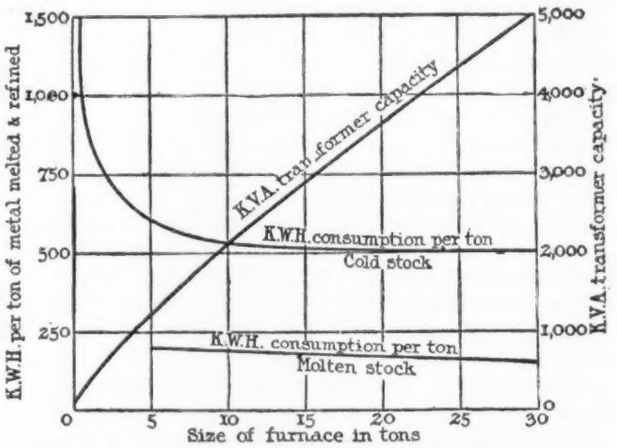
Traction

Electric Traction.—N. MAZEN.—Electric traction has the advantages of distributing the motive power along the train, achieving rapid acceleration and higher speeds than are attainable by steam, avoiding smoke and rendering possible the use of water power. Economically steam lines are cheaper to operate than electric, and the installation costs are lower, but these considerations are counterbalanced by the possibility of running increased freight and passenger services by electric methods. A French committee has been collecting information on the subject of electric tracton for the government, and the Belgian government has decided to start by electrifying the line from Brussels to Antwerp. —*Technical Supplement to Review of Foreign Press*, July 22, 1919. (Abstracted from *Bulletin* of Société Française des Electriciens, May, 1919.)

Long-Distance Traction in Germany.—The well-known advantages of electric operation of main lines are stated. It is said that the Prussian Railway Administration is about to commence experimenting with oil-fired locomotives. These will possibly be fitted with Diesel engines and will be used for hauling a certain number of trains on electrified sections of the system, thus relieving some of the load coming on to the power stations through this particular kind of traffic. These oil-engine locomotives will be able to use by-products from the railway generating stations, and their number, forming about one-fifth of the total locomotive contingent, will thus be available for war purposes where trains have to be hauled over enemy tracks which are not electrified. In addition to the oil-fuel locomotives with Diesel engines and electric power transmission to the axles, which have been proposed, important work is now in progress for the development of oil locomotives with gas turbines and electric power transmission. If these experiments are successful, this will open up a new stage in the development of mechanical engineering, whose initial basis is electric traction: for the economic basis for the introduction of this new type of engine and locomotive is laid by the proposed erection of railway power stations in which the coal will be gasified and the by-products recovered, while locomotives will be free for the purpose of compensating the peak loads at the stations, for, as has been stated, certain of these engines will be self-contained units. The technical basis for long-distance electric traction has been laid down for some years now. The use of single-phase alternating current at 16⅔ cycles per second and 15,000 volts line voltage has been agreed upon between the railway administrations of Baden, Bavaria and Prussia. It is thought that Saxony and the other states will also come into line unless the proposed unification of the railway systems of Germany renders this superfluous. Although the work necessary to introduce electric traction on to the main lines of the Magdeburg-Leipsic-Halle and the Silesial Mountain Railway was interrupted by the war, the Prussian State Railways have already carried out trials with new types of locomotives of extraordinary high capacity (up to 3000 hp.). The result of these trials is that it is considered that the number of fundamental types of locomotive can be restricted to three or four, which can be designed so as to give low maintenance costs, simple working arrangements and high annual efficiency. The work on the sections mentioned above was resumed last November, and it is hoped to have them in running order by about the middle of 1920.—*Technical Supplement to Review of Foreign Press*, May 27, 1919. (Abstracted from *Zeits. der Ver. Deutsch. Ingen.*, April 5, 1919.)

Installations, Systems and Appliances

Developments in Electric Iron and Steel Furnaces.—J. BIBBY.—Among the considerations in any proposal for installing electric furnaces are the available electric power and the price at which it may be obtained. The illustration shows the capacities of transformers which



INFLUENCE OF FURNACE ON ENERGY CONSUMPTION AND TRANSFORMER CAPACITY NEEDED

must be supplied for given sizes of furnaces. The capacity of the transformer required per ton decreases as the size of furnace increases because the radiation losses are proportionately greater in the small furnaces. Also the consumption of energy per ton decreases as

the size of the furnace increases. On a well-designed furnace the power factor is in the neighborhood of 0.8, but it is necessary to have a large reactance, say 10 per cent or 12 per cent, in the system to choke down the unavoidable fluctuations of current in the arc. The most severe trial to which the plant can be put is when it is required to melt rough cold scrap, and when working on this duty momentary overloads of from 50 to 70 per cent may occur, so that the transformers must be designed for such an emergency. The load factor on a single furnace working night and day is about 35 per cent, but when working two furnaces it is 50 per cent, which compares favorably with other loads on electric generating stations.—London *Electrician*, Aug. 29, 1919.

Electric Furnace for Experimental Work.—F. A. J. FITZGERALD and GRANT C. MOYER.—A small electric furnace is described for general experimental purposes required of laboratory apparatus.—*Proceedings A. E. S.*, Sept. 23, 1919.

Mine Electric Signaling Practice.—TERRELL CROFT.—The author states that mine signaling systems are of several varieties and may be either visual, audible or telephonic, operated by battery, magneto or power. Some types require carefully insulated lead-covered or even armored cable, while others employ bare wire. It is said that ordinary push-buttons used in residences are unsuited to the rough usage that they are sure to experience when installed for mine work.—*Coal Age*, Aug. 21, 1919.

Magnetic Field of a Solenoid.—O. BILLIEUX.—The determination of the self-induction, the mutual induction, the field, etc., of industrial windings is a problem which has not yet received a definitive solution, but by the examination of particular cases rigorous formulas have been established. The author develops a solution of this kind for the determination of the field of a cylindrical winding of any length by simply assuming that the radial thickness of the conductors is small in comparison with the radius of the winding and that the intervals between helices are very small.—*Revue Générale de l'Electricité*, July 19, 1919.

Electric Welding: Its Theory, Practice and Application.—H. S. MARQUAND.—In this number of the series the author deals with the welding of copper and copper alloys. He states that copper can also be welded with the graphite electrode, but it is necessary to prevent the molten copper from running out of the joints, which may necessitate building temporary molds of clay or other material round the joint. A good flux for this purpose is said to be sodium phosphate and boracic acid. Copper alloys, such as brass, manganese-bronze, phosphor-bronze, etc., are very difficult of treatment, because the zinc, manganese, etc., burns very rapidly, leaving only copper in the weld.—London *Electrician*, Aug. 8, 1919.

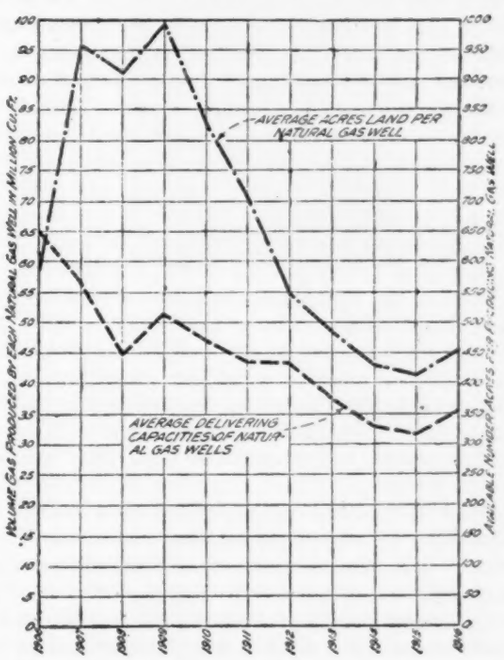
The Design of Electric Furnaces.—R. C. GOSROW.—Considerations of the elements of size and other details in the relation to operation and the recovery of metal with special reference to the production of ferromanganese. The author states that the large furnace properly designed in each component part can be made as efficient as a unit one-half or one-fourth the volume or capacity. But increasing the power input to double or triple is not alone sufficient. Decreasing the area of crucible to electrode area may not bring desired conditions. By a careful study of the relations which essential components bear to each other the efficient operating unit can be constructed, regardless of size of transformers or output.—*Chemical and Metallurgical Engineering*, Sept. 1, 1919.

Telegraphy, Telephony and Signals

Propagation of Current Upon a Homogeneous Telephone Line Under Varying Conditions and with Apparatus at the Extremities.—J. B. POMEY.—In this article, a résumé of a classroom lecture, the author (1) gives the formulas which apply to an artificial line formed of identical sections; (2) calculates the recurrent polynomials of the second order already introduced by Vaschy and gives formulas for the addition of indices; (3) integrates the telegraphers' equation, taking account of the apparatus and making the number of sections of the artificial line increase indefinitely. In addition, he considers the variable operation which follows the instantaneous introduction of a constant emf. —*Revue Générale de l'Electricité*, Aug. 2, 1919.

Miscellaneous

Methods for More Efficiently Utilizing Fuel Resources. —SAMUEL S. WYER.—The author states that natural gas deserves to be considered the most valuable of our



DECLINE IN NATURAL GAS RESOURCES OF WEST VIRGINIA
Based on data compiled by United States Geological Survey

mineral fuels, because it occurs in nature as a refined product ready for efficient utilization. Natural gas has been so easily tapped and burned that it has been the least appreciated, and as the result of abusive use we shall in a few years lose its services if the situation is not remedied. This installment of the fuel series also treats of the production and transmission and distribution of this gaseous fuel.—*General Electric Review*, August, 1919.

National Electrical Safety Code.—GEORGE E. QUINAN. —The question is discussed whether a national safety code would be possible which would not prove irksome under Western conditions, or whether a separate code should be determined upon under the authority of the commissions.—*Journal of Electricity*, July 15, 1919.

NEWS OF THE INDUSTRY

Chronicle of Important Events and General Activities in the Technical, Commercial and Manufacturing Fields

SHOULD THE JOBBER MARKET FARM-LIGHTING OUTFITS?

Central Division of Electrical Supply Jobbers' Association Recommends Raising Requirements for Admission to National Body

Whether the jobber should handle farm-lighting outfits and whether the small jobber should be admitted to the Electrical Supply Jobbers' Association were the subjects mostly discussed at the meeting of the central division of this association held in Chicago on Sept. 15.

Discussion of the paper on marketing of farm-lighting plants which was presented by C. J. Litscher of the C. J. Litscher Electric Company, Grand Rapids, Mich., brought out that this equipment might be profitably handled only on a large scale, that is no less than 1000 machines per year. A separate department must be organized as the handling of the equipment is entirely unlike the ordinary jobbing business. The territory must be studied and the particular plant handled must be advertised so intensively in this territory that its name will predominate over that of any other plant. Cash payment by the dealer to the jobber was thought to be absolutely essential. Special salesmen must be employed and a service department must be maintained for setting up the plants and for giving advice and remedying trouble. The service men should educate their dealers in order to get part of the work off their own hands. An added incentive to selling the plants is the good profit which may be made on supplies, both original and renewal. It was the sense of the meeting that the jobber is better fitted than any one else for this business.

Rather heated discussion followed a paper on the advisability of admitting smaller jobbers to the association. The outcome was a motion of recommendation to the executive committee of the association to raise the requirements for admission so that an eligible jobber must have a stock of $100,000 instead of $50,000 and must do an annual business of $350,000. The paper which led the discussion on the small jobber was prepared by James Clark, Jr., of the James Clark, Jr., Electric Company, Louisville, Ky.

Another subject discussed was the poor profits from washing-machine sales. A. E. Loeb of the Avery & Loeb Electric Company, Columbus, Ohio, in a paper on "The Growing Demand for Household Devices," pointed out that the low margin of profit results because the manufacturer sells direct to the dealer and at a discount almost as high as he gives the jobber. The manufacturer really does not feel the necessity of the jobber. This was thought to be partly the jobber's fault, and a committee on household motor-driven labor-saving devices was appointed to present the jobbers to the manufacturer as the natural channels of distribution.

Determination of turnover was explained by H. F. Thomas, Northwestern Electrical Equipment Company, St. Paul, Minn. Mr. Thomas classifies all sales according to about forty leading lines of materials. The enormous amount of accounting and filing which this division necessitates is facilitated by a "Hollerith" machine.

The bad credit of municipalities was a topic brought up by A. W. Lindgren, Northern Electric Company, Duluth, in a paper on "Credit." The necessity for going carefully on municipal jobs was emphasized. Trade acceptances were given a general "boost," especially for slow payers.

P. Stern, Interstate Electric Company, New Orleans, La., reviewed overhead expenses for the last three years and predicted that only by strict economy and closer watch on routine work will overhead be reduced for the next year.

An analysis of the causes of high prices was set forth by F. D. Vanwinkle of the Post Glover Electric Company, Cincinnati. The suppression of labor agitators was urged as one means of relief.

H. C. Downing, Downing Electrical Company, Des Moines, Iowa, brought out that a salesman can be of benefit to his house by helping the accounting department on collections.

The discussion of a paper on marketing storage batteries by L. W. Korsmeyer of the Korsmeyer Company Lincoln, Neb., followed the same line as the farm-lighting discussion, the conditions being similar.

ATLANTIC SUPPLY JOBBERS MEET IN PHILADELPHIA

Discuss Advisability of Carrying Side Lines and Maintenance of Resale Price Situation as a Result of Decision in Colgate Case

The extent to which side lines should be handled in connection with the electrical supply jobbing business was discussed extensively at the regular fall meeting of the Atlantic division of the Electrical Supply Jobbers' Association, held Sept. 17 at the Bellevue-Stratford Hotel, Philadelphia, at which approximately 100 jobbers and manufacturers were present.

E. C. Graham of the National Electrical Supply Company, Washington, D. C., opened the morning session with a consideration of the handling of automobile accessories as a side line for electrical supply jobbers. The ensuing discussion brought out comments from F. R. Elliott of the Elliott-Lewis Electric Company, Philadelphia, and F. S. Price of the Pettingell-Andrews Company, Boston, in respect to both mechanical and electrical automobile accessories. The thought left seemed to be that great care should be exercised in the choice of electrical automobile accessories and the method of handling them.

The discussion on the handling of radio apparatus was led by C. P. Hill of the Doubleday-Hill Electric Company, Pittsburgh, Pa., and that on the handling of lighting fixtures was led by J. R. Powers of the Wheeler-Green Electrical Supply Company, Rochester, N. Y., with comments by Mr. Price.

A. A. Gray outlined what had been done in connection with the association's publicity campaign and the plans for the future. He spoke of a booklet soon to be prepared which would indicate the position of the electrical supply jobber in the trade. The remainder of the morning was taken up with a discussion led by W. E. Robertson of the Robertson-Cataract Company, Buffalo, N. Y., on the value of the appliance business in the electrical jobbing trade. A warning was given with respect to the amount of business now being done by plumbing and hardware jobbers through the demand for electrical appliances. It was felt that more attention should be paid by electrical jobbers to these encroachments into a thoroughly electrical field. The morning session adjourned after O. F. Rost of the Newark Electrical Supply Company, Newark, N. J., had spoken on the utilization by the jobber of electric contractors as contractor-dealers.

The afternoon session opened with a report from the chairman of the uniform accounting committee and the responses received from various jobbers regarding their utilization of the uniform accounting system sent out by the committee. This committee was scheduled to meet in New York City this week.

The topic set for the afternoon discussion was "Maintenance of Resale Prices." Thomas M. Debevoise, general counsel for the association, led the discussion on this subject, and in view of the findings in the recent Colgate case brought out very clearly the position of the manufacturer in respect to the jobber and of the jobber in respect to the retailer in regard to their liberty in refusing to sell products as they see fit.

THE BUSINESS OUTLOOK

An address of much general interest was given by Sidney A. Lincoln of the Babson Syndicate on the business outlook. Using charts and some statistics, he showed why he considered general business at the present time to be in very good shape, with especial emphasis on the electrical trade. He predicted that the volume of electrical business would not shrink to any great extent before 1921.

E. D. Tolles, secretary of the association, itemized some figures on overhead expense, derived from reports received from jobbers who had adopted the uniform accounting system.

Franklin Overbagh, general secretary of the association, spoke of the successful meetings held two days previous by the central division, during which session there was considerable discussion as to the policy of changing the requirements for admission into the association. In the discussion which followed, mainly fostered by G. L. Patterson of Stanley & Patterson, New York City, and W. E. Robertson, it was brought out that all possible encouragement should be given to small jobbers and those just entering the field to join the Electrical Supply Jobbers' Association, because, through contact and association with firms already of standing in the trade, the newcomers could derive considerable benefit in regard to costs of doing business and thereby carry on a more intelligent competition.

HUGH M. WILSON DIES SUDDENLY AT HIS HOME

Former Vice-President of McGraw Publishing Company Leaves Remembrance of Active Constructive Life as Publisher of Business Papers

Hugh M. Wilson, former vice-president of the McGraw Publishing Company, one of the constituent companies making up the present McGraw-Hill Publishing Company, died suddenly at his home in Stockbridge, Mass., on Sept. 19.

Mr. Wilson will long be remembered by an unusually large circle of business men in various industries for his distinctive remarkable qualities of character. Among the permanent and treasured impressions left by his vigorous personality and life are those of the persons who were actively associated with him in business.

HUGH M WILSON

To his employees and associates Mr. Wilson was an inspiration whose lessons profoundly influenced their work and thus their service to the industries reached by the papers in which he was interested. It was as publisher of the *Railway Age* that Mr. Wilson won national and even international renown. Shouldering all of the responsibilities of publisher, Mr. Wilson yet found time to guide and advise the members of the editorial staff. His sympathies and personal activities reached every part of the field. His editorials were masterpieces of straight thinking and clear expression. What he said as well as what he wrote went directly to the point. It was constructive helpfulness that he sought for the papers for which he was responsible.

The circle of Mr. Wilson's friends extended far into other industries than those of the steam-railroad and allied lines of manufacturing in which he made his first great success. His development of the *Electric Railway Review*, later consolidated with the *Electric Railway Journal*, brought him into close contact with the leaders in that field. His connection with the publishing business was interrupted for two years after sale of the *Railway Age* and *Electric Railway Review* in 1908, but from 1910 to 1917 as vice-president of the McGraw Publishing Company he was an active, wholesome force in the upbuilding of that company and its newspapers, the ELECTRICAL WORLD, *Engineering Record, Metallurgical and Chemical Engineering, Electric Railway Journal* and *Electrical Merchandising.*

Edison Companies in Post-War Convention

Activities Resumed in Meeting at New London and Problems of the Industry Are Discussed with Confidence in the Outlook for the Future

RETURNING with keen interest to the pre-war practice of conference on central-station problems, the members of the Association of Edison Illuminating Companies held their thirty-eighth convention from Sept. 15 to 18 at the Hotel Griswold, Eastern Point, New London, Conn. In the numbers who attended, in the selection and treatment of subjects concerning the industry vitally at this time and in its appreciation of the large issues before the industry in the future, the convention was noteworthy. There was also an elaborate program of entertainments, which began with the reception on the evening of Monday, Sept. 15.

President Leonard L. Elden opened the business sessions on Tuesday morning, Sept. 16. The president's address called attention to the program of committee reports and papers dealing with the changes and developments in the industry during the entire period since the 1916 convention. President Elden also discussed the general problems before the industry.

"When conditions are favorable for the interconnection of electric supply systems," said Mr. Elden, "there is probably no branch of the business where an additional investment may be made which will develop greater economies or yield a larger return. Much has already been done in this direction where necessity demanded, but on every hand there still remain wonderful opportunities for linking up properties to facilitate interchange of power and pooling of spare capacity.

Opportunities in Interconnection

"Moderate expenditures in some locations will effect phenomenal results in conserving fuel through the cessation of the operation of uneconomical plants and at the same time release large amounts of spare capacity in generating equipment for use in serving new business. Typical cases have shown savings in fuel alone sufficient to pay for the entire cost of connections in three years, while releasing spare-plant capacity equivalent to 30 and 40 per cent of the maximum load of the combined interconnected systems. Such opportunities should not be overlooked or considered along narrow lines in any way limited by local prejudice, for any interconnections which can now be justified must in the future more easily prove their worth.

"Conservation of fuel is now generally accepted as a question of primary importance in our national life.

"In nearly all hydraulic developments a considerable quantity of waste power is developed through seasonal variations in river flow or during freshet periods. If the load characteristics of the hydraulic company do not permit of the use of such waste, then connections should be made with other systems dependent upon steam for generation, to permit of its absorption, when it can be done without actual loss.

"The absorption of by-product power when available is another method of economically conserving fuel which is entitled to serious consideration. Opportunities of this character exist in certain manufacturing processes which require large quantities of steam for their operation. Power thus developed may well be secured by a central station for delivery to its distribution system and, presumably, at a cost commensurate with its value as a by-product."

Standardization Needed

President Elden then took up the question of standardization. "For many years," he said, "concerted efforts have been made toward the standardization of certain lines of equipment used in the generation and distribution of electric service. Manufacturers have emphasized the fact that with a more general acceptance of standardized equipment reductions in cost would follow through the economies effected in manufacture and reduction in surplus stocks which are carried to meet the demands of the operating companies.

"The fact that certain companies still require special apparatus, such as motors, transformers, etc., renders efforts toward standardization ineffective, so far as results are reflected in costs.

"Reduction in the number of varieties of stock to be carried and the elimination of all special or inactive materials have been found effective in materially reducing stock accounts when such results were imperative.

"Two years' experience in the application of an 'off-peak rate' for secondary service has clearly demonstrated the economic value of such a rate if service is supplied under suitable restrictions.

Regulation of Voltage

"Regulation of voltage as practiced by many companies may be very materially modified to permit wider variations from a standard value without in any way impairing the average quality of the service. As the higher degree of regulation is always controlled by the requirements of the lighting service, the almost general use of tungsten lamps permits a substantial change from the standards of regulation previously considered desirable with gem and carbon lamps. Variations of 5 per cent, plus or minus, from standard are accepted as satisfactory service in a majority of such installations, and even wider variations have been noted without complaint of the consumer or efforts on his part to provide equipment to improve the lighting service. In local house distribution 4 per cent regulation appears to give satisfactory results in place of the 2 per cent standard formerly maintained, provided, however, that the lower value does not fall below that required for the successful operation of household appliances.

"It is not unreasonable, therefore, to anticipate that in the future 5 per cent regulation may be accepted as satisfactory for lighting service, a standard which has been accepted in England and on the European continent for many years.

"A modification of regulating limits must ultimately be a substantial factor in reducing the investment required in a distribution system, for it must allow that the closer the degree of regulation the higher the investment required for a given capacity and output. It may be difficult at first to determine the amount of reduction in a particular case, but the cumulative effect of continually employing smaller conductors for exten-

sions, installing two-wire services when feasible, and selling large blocks of unregulated power must eventually be reflected in final costs of plant.

"Closely allied to this question of regulation is the much-discussed subject of power factor and its effect on all the operations of an electric utility."

Mr. Elden advised that every company take steps to maintain its plant accounts in such form that the higher costs of construction prevailing in the past few years may be clearly in evidence.

In directing consideration to the fact that municipal and privately owned plants have suffered severely during this period through higher costs of fuel, labor and materials the president said:

Opportunities for Business

"There still remain many opportunities for our companies to obtain added business from such sources, a field which should be exploited to the utmost if we are to obtain the maximum advantage of present opportunities. Street-railway systems now operating independently may later find a partial solution of their present difficulties by obtaining their power from our utilities.

"The enormous possibilities for the sale of power in connection with steam-railroad electrification must not be lost sight of in future developments to increase output and efficiency."

In referring to labor conditions Mr. Elden noted that those industries in which the employees have acquired an interest in the business enjoy comparative freedom from labor troubles and, in general, enjoy harmonious relations with their employees. He added:

"It is gratifying to realize that no reflections can be cast upon the electric lighting industry for its lack of consideration for its employees during the trying periods of the past and present."

Following the president's address the reports of the executive committee and the treasurer were submitted. The report of the committee on standards, William C. L. Eglin chairman, and the report of the committee on utilities' publications, E. W. Burdett chairman, were next presented.

The committee on metering and service methods, O. J. Bushnell, chairman reported little development in metering except in the measurement of maximum demand. New or improved demand meters are described which complete or supplement present lines so that there now seem to be available meters suitable for every class of service. Other matters of company practice were discussed by the committee.

Three papers were also presented at the Tuesday morning session, as follows: "A Uniform Policy for Making Distribution Circuit Extensions and Service Connections to Consumers," by D. S. Boyden; "High Current Tests on Oil Circuit Breakers," Philip Torchio; "Dielectric Power Loss and Ionization Voltage in Underground Cables," by F. M. Farmer.

Lamp Session

Tuesday evening was devoted to a discussion of lamps and central-station lamp practice. The report of the lamp committee, J. W. Lieb chairman, is an annual compilation rich in original data of the quality and performance characteristics of incandenscent lamps, large quantities of which are purchased by members of this association under test. Following the report there was a symposium on "Central-Station Lamp Practice" participated in by the following: Louis A Ferguson, vice-president Commonwealth Edison Company, Chicago; J. T. Hutchings, president Rochester Railway & Light Company; Robert Lindsay, vice-president and general manager Cleveland Electric Illuminating Company, presented by Dr. William McClellan, vice-president of the company, and W. F. Wells, vice-president Brooklyn Edison Company.

The four companies represented by executives in this symposium have adopted different attitudes toward the supply of lamps to their customers. The papers were discussed by J. W. Lieb, Walter H. Johnson, T. I. Jones, C. L. Law, Alex Dow, C. L. Edgar, John W. Howell and others. The advantages and disadvantages of the several plans of lamp handling were put forward in the course of these discussions, which extended until the midnight hour. There was a practical consensus, however, in favor of vigorous educational activity with a view to demonstrating the advantages to the public as well as to central stations of the more intelligent and liberal use of light, and it was emphasized that whatever the practice of the company in the handling of lamps considerable advance can be made along this line.

Two business sessions were held on Wednesday, Sept. 17, in the morning and the evening. Alex Dow, chairman, presented the report of the committee on rates. A paper on "Status of the Customer Whose Service Requires Large Investment," by James V. Oxtoby, was then read.

Personnel of the Industry

"The Personnel of the Industry," an address by William C. L. Eglin, was heard with keen interest as a study by one who feels a personal concern regarding the movements affecting the ranks of employers in the industry and as a presentation of work of this character in the Philadelphia Electric Company. Mr. Eglin declared that the time has come for a more systematic development of all plans relating to the compensation and general welfare of the personnel. Taking up hours of labor, rates of wages, collective bargaining, trade unions and employment of women and minors, Mr. Eglin suggested as a possible solution the organization by each company of a personnel bureau. In this the development and direction of all relations with employees as to welfare and progress would be centered.

Three addresses were made at the Wednesday evening session.

M. O. Leighton, consulting engineer, Washington, chairman executive committee of the engineers, architects and constructors' conference on national public works, presented a paper on "Lessons of the War in Relation to the Government's Business." Mr. Leighton outlined the condition of affairs in pre-war days which had made the government an inefficient instrument of business.

Mr. Leighton urged support of the Jones-Reavis bill to create a Department of Public Works.

Francis Pratt, vice-president General Electric Company, gave many details in his presentation of "War Undertakings and Developments in the Industry During the Past Three Years." On account of the imperative war demands made upon the manufacturing companies during the last three years, relatively little was accomplished in advancing the electrical art along the usual lines of commerce. There was, however, great activity along rather unusual lines which resulted in a

number of very interesting developments, and Mr. Pratt reviewed briefly the more important of these undertaken by the General Electric Company, together with those which have been actually taken in hand since the signing of the armistice and which it is hoped will materialize for the future benefit of the industry.

"Vision in Power Development and the Test of War" was the subject of an address by Frederick Darlington, Westinghouse Electric & Manufacturing Company. Mr. Darlington as chief of the power section of the War

W. H. JOHNSON

Industries Board during the active war period was in close touch with the plans for mobilization of power resources of the nation.

CENTRALIZATION OF POWER MANUFACTURE

Mr. Darlington indicates that with the coming of war with its imperative need for greatly increased power service the electric power systems of the country were far progressed toward centralization of power manufacture. What the war brought out was direct confirmation of the principle enunciated by leaders in central-station development, and no doubt remains of the fundamental soundness of the centralization of power manufacture.

At the last regular business session on Thursday, Sept. 18, a large part of the discussion was on fuel and kindred problems. H. P. Liversidge, chairman of the committee on steam plants, presented the report of that committee.

George A. Orrok, consulting engineer, read a paper on "Some Phases of the Fuel Problem." Mr. Orrok showed the advantage of efficiency in boiler-room operation and the extent to which poor coal is responsible for large losses in this direction. He discussed the utilization of pulverized fuel since the improvement of the methods for burning it. Mr. Orrok also went into the question of burning oil as fuel.

Prof. L. P. Breckenridge, Yale University, gave interesting data on "The Supply and Distribution of the Fuel of the World, Particularly of the United States." A paper, with detailed statistics, on "Pulverized Fuel," was read by Fred Scheffler, engineer of the Fuller Engineering Company.

C. H. Delany, Pacific Gas & Electric Company, presented a paper on "Oil as Fuel in Steam Plants." This was based on the actual experience of Pacific Coast plants with oil-burning installations.

John Anderson, Milwaukee Electric Railway & Light Company, discussed experiences of that company with pulverized fuel.

The report of the committee on electricity distribution and use, of which R. F. Schuchardt is chairman, also presented before the convention, covered many subjects embraced within the scope of its viewpoint from the engineering as well as the commercial and the executive aspects. It emphasized the advantage of building always with an eye to the future, of interconnecting wherever that is possible and of doing everything possible to avoid duplication of investment. The committee is enthusiastic over the opportunities before the industry.

Officers for the ensuing year were elected at the banquet which closed the convention on Thursday evening. Walter H. Johnson, Philadelphia Electric Company, was elected president; M. S. Sloan, Brooklyn Edison Company, vice-president; Preston S. Millar, Electrical Testing Laboratories, secretary, and Ernest L. Edkins, Commonwealth Edison Company of Chicago, treasurer. Members of the executive committee are W. W. Freeman, Samuel Insull, John W. Lieb, Joseph B. McCall and Charles L. Edgar.

Included in the elaborate provisions for entertainment were trips on United States Navy destroyers with demonstrations of wireless telephony to hydroplanes and submarines.

TESTIMONIAL GIVEN TO EDWARD N. HURLEY

Society for Electrical Development Presents Parchment to Former Chairman of Shipping Board Testifying to His Patriotic Service

At a luncheon given in his honor at the Engineers' Club, New York, on Sept. 19 by prominent men of the electrical fraternity, representing the Society for Electrical Development, Edward N. Hurley was presented with an engrossed parchment testimonial expressing appreciation of his work while head of the United States Shipping Board.

The presentation was made by J. M. Wakeman, general manager of the society, who said in part:

Representing the officers, directors and members of the Society for Electrical Development, I take the greatest pleasure in presenting you, sir, with this engrossed copy of the resolution passed by the directors and bearing their signatures, testifying their appreciation of the valuable and truly wonderful services you, as chairman of the United States Shipping Board and chief executive of the Emergency Fleet Corporation, rendered not only to this country but to the entire world. Your work, Mr. Hurley, will be given a prominent place in history, and we rejoice in the feeling that you are one of the oldest members and stanchest friends of the Society for Electrical Development. We feel honored that we are permitted to thus record our appreciation of your great achievements.

In acknowledging the presentation Mr. Hurley said:

I resigned my job with the Shipping Board to get back to the electrical business, and I have spent some six weeks investigating what has been going on since I left it to take up governmental work. I am astounded at what has been done.

I think the whole electrical industry can well take to heart this message: Hold up your head and be of service. That is the thing the electrical industry exists for—to be of service.

Meeting of Southeastern Section, N. E. L. A.

R. H. Ballard, President of the Parent Association, Shows Interest in Development of Section Work and Participates in Discussions at Asheville Convention—Section Maintains Reputation as Hard-Working Body

HONORED and inspired by the presence of President R. H. Ballard of the parent organization, the Southeastern Section of the National Electric Light Association at Asheville, N. C., Sept. 17 to 19, in annual convention, produced sufficient evidence not only to retain but to add to its reputation as a hard-working body.

At the session of the second day Mr. Ballard presented, according to program, a forceful address on the problems of the industry which central-station men are facing and offered suggestions for surmounting them. He not only brought to the meeting constructive suggestions and advice but as well two other things that made an indelible impression—first, a genuine appreciation of the possible work and purpose of the geographic section, and, second, an interpretation of the Pacific Coast spirit. This he defined as a combination of confidence, optimism, courage and audacity, a definition which he later found applies as well to that spirit which binds together the leaders in thought and purpose of the Southeastern Section. An abstract of Mr. Ballard's remarks appears on an adjoining page.

Address of President Flanigen

Following a cordial welcome from Gallatin Roberts, Mayor of Asheville, N. C., the work of the seventh annual convention of the Southeastern Section was formally opened by the address of its president, C. D. Flanigen. In this address the president reflected the strenuous circumstances of war-time operation of public utilities and in appropriate remarks expressed the patriotic spirit that prevailed in the service that was rendered. In addition he reflected the experiences of one who for more than a quarter of a century has been active in serving the public. His comments on the progress of the art and the tendencies of the future as he sees them and revealed them in his address make it a record of unusual interest and value to the proceedings of the section.

In referring briefly to the ever-present rate problem, he noted a tendency toward a fuller understanding by commissions of public utility problems when full information and data are made available. He pointed out that the industry now has a new problem, that of taxes. In part he said:

"A serious problem of the reconstruction period is the tax burden that with greater or less injustice is placed on corporations, particularly public service corporations, a burden which frequently is largely in excess of that imposed on individuals. The books and accounts and every phase of the business of the public service corporation are open to the scrutiny of the tax-assessing authority, while in Georgia, and perhaps in other states in the South, merchants give in their property as their consciences permit without disclosing their books and accounts. An indirect and unjust tax on the resources of the average public utility follows the verdicts of the courts in damage cases, which are frequently decided, not as justice directs, but in accordance with the prejudice of a jury whose sense of fairness is blinded by the very common feeling that the corporation is able to stand the loss if a fellow citizen gains."

Reference was then made to increases in the cost of living and the unrest among all classes of workers. The fair view which he takes of the situation and his optimism for a future solution advantageous to all are expressed as follows:

"I believe that the great majority of the so-called labor element, particularly those of American birth and parentage, will come forward in advocacy of fair methods and a respect for the rights of others. This change must, in the nature of things, be gradual and it must be met by the honest coöperation of capital."

In regard to the commercial side of central-station operation, President Flanigen pointed out that in the South the servant problem has helped to bring out more prominently than before the importance of selling activity in the field of labor-saving appliances. He said that three years ago it was almost impossible to sell a washing machine to a Southern housewife. To-day the manufacturers cannot supply them in numbers sufficient to meet the demand. He pointed out that sweepers are also popular, while the demand for home heating and cooking appliances has rapidly increased.

Obligations of the Public Utility and the Public

C. Murphy Candler, chairman of the Georgia Railroad Commission, in a masterly address at the opening session of the convention presented some plain truths regarding the obligations of the public utility to the public and vice versa.

Working on High-Voltage Lines

In a paper entitled "Live-Line Maintenance," T. F. Johnson of the Georgia Railway & Power Company described the method he has developed during the past few years for work on live lines of 110,000 volts and under. Special reference was made to the so-called "buzz-stick" methods for locating defective insulators of either the pin or suspension type. The details of these methods were essentially the same as described by him in the ELECTRICAL WORLD for Sept. 13, pages 568 to 572. Among those who discussed the paper were J. M. Barry, Alabama Power Company, and H. L. Wills, Georgia Railway & Power Company.

Report of Public Policy Committee

In the absence of W. H. Glenn of the Georgia Railway & Power Company, chairman of the public policy committee, the report of that committee was presented by W. Rawson Collier of the same company. In reviewing the conditions causing unrest in all industries as a reaction from war to peace, the committee points out that public utility companies have other troubles in addition to these.

"Public utility companies," says the report, "have been almost swamped with increasing costs of production, especially those utilities linked up with street railways. In this particular branch of the business the

labor costs amount to 65 per cent to 70 per cent of the entire operating expenses. This percentage is not nearly so large in the lighting and power business, but is fully offset by the fact that fuel plays a very conspicuous part in the operating costs of a central station. The items of labor and fuel—to say nothing of other classes of materials—have increased enormously.

"But the utilities, unlike other lines of business, could not of their own volition advance their rates to absorb these increases. Luckily some of us were under the jurisdiction of authorities wise enough to see the value of the utilities to the communities and who were willing to approve rates that would enable the companies to continue furnishing service. Another thing most fortunate for the companies and the people of this Southeastern Section is the presence of so many well-developed water-power properties. In 1917 the energy furnished by these properties took the place of more than 3,000,000 tons of coal."

In a paper on the socializing of utilities, particularly railroads, telephone and telegraph systems, street railways and coal mines, F. G. R. Gordon gave many data covering those systems in this country and abroad that are so operated.

ADDRESS OF NATIONAL PRESIDENT

In an inspirational address before 150 delegates and guests on the second day of the convention R. H. Ballard, president of the national organization, reviewed in much detail the problems of the industry and in a spirit of optimism pointed out the solutions that now seem possible. In regard to the functions and work of geographic sections, President Ballard said in part: 'The geographic section idea is one very close to my heart and one which I think is the most effective means for coöperation and coördination in our great industry as a whole. It may be that the time will come at no far distant date when one national convention will not be so large and will primarily consist of business sessions dealing with national subjects with delegates from geographic sections; but this is something for the future and can only come about when all the country is organized into separate geographic sections. We all know that these geographic section meetings are the places where personal contact between the sections and the employees is best worked out and where the most effective work of coöperation and coördination is done. We know that the section is the place where individual initiation is felt and where men come into prominence. It is the place where we should effect a coördination of all branches of the industry, with the manufacturer, with the jobber and with the contractor-dealer."

In regard to the present state of unrest in industry, he expressed the opinion that the trouble is both economic and sociological. The economic situation, he believed, would work itself out through the old law of supply and demand, with a curbing of profiteering on the one hand and the elimination of too strict regulation of business in general on the other. "We are," said Mr. Ballard, "too prone to pay attention to a minority opinion in our country from the malcontents, the clamorers and the 'grouches.'" In this connection he added: "There was never a time in the history of the electrical industry when we should consistently practice the strong-minded idea like the present. We are confronted by high prices, high cost of living and all these things. The answer rests in more production and more saving. One of the big opportunities for conservation is the development of water powers by which electrical energy can not only be obtained for light and power service but be released to other fields."

In commenting upon service rendered and a fair rate of return, President Ballard declared that when service is established on an honest, courteous treatment basis and customers made to feel that it is a pleasure to do business with them, there need be no apprehension in regard to a fair return being allowed by regulating bodies because such a basis of service makes it an easy job for a regulating body to grant increases where necessary. He added: "One difficulty confronting us is that the public at large does not know what the general attitude is of the electrical utilities of America, and to remedy this we have organized a committee of the national association on public information, which will finally get the public to understand our business in life."

Another important problem of the future, President Ballard pointed out, is the association of employees in the business in such a way as to create an interest that will result in greater production, contentment with work in hand, and remove the fear of want in old age. He explained in some detail one plan by which employees can buy stock on such a basis that they participate in the business and have a voice in its affairs. Pensions, mutual benefits and insurance plans were referred to as important factors in welfare work which if properly studied will furnish an answer to strikes, socialism and general unrest.

SAFEGUARDING THE EMPLOYEE

H. L. Parish, Durham (N. C.) Traction Company, in a paper dealing with the safety-first movement among central-station companies outlined the essential features in organizing and conducting such work in an individual company. He advised the appointment of a safety engineer to head the safety department. The work of such a department can then best be conducted through a foremen's committee made up of the foremen of all operating departments. Such a committee should have a schedule of work covering the following points: (1) Neatness; (2) discipline; (3) instructions; (4) periodic inspection. Instruction, talks and general meetings to discuss the work are then all that is required to make the work effective.

The author of the paper explained a system of records that can be kept covering the work done. Physical examinations, granting of prizes for work done, safety equipment for operators and for apparatus, lectures by outside authorities on safety and hygiene were among the other points taken up.

In discussing that part of Mr. Parish's paper dealing with a physical examination H. L. Wills of the Georgia Railway & Power Company pointed out that while this is essential, companies should bear in mind that the faithful employee, worn out by service, should not be discarded but some provision made for him commensurate with his service.

N. E. Cannady, state inspector of North Carolina, explained the work of the North Carolina Safety League, which has been established to promote safety work through all institutions, including schools.

H. A. Orr, Southern Public Utilities Company, in referring to the use of the pulmotor and other mechanical devices for resuscitation from electrical shock, gas asphyxiation, etc., called attention to the fact that the prone-pressure method is always of great value and

employees should be instructed in this method. It is during the first few minutes that best results can be secured, and in many cases life is lost in waiting for the arrival of the pulmotor. When the prone-pressure method is used the patient can sometimes be revived before the pulmotor arrives, and in all cases this practice should be followed.

William Rawson Collier of the Georgia Railway & Power Company described the use of the pulmotor by that company and stated that these machines have been made available at the company's substations free of cost for doctors and are sent when requested by automobile with an expert operator. He mentioned that many cases of pneumonia have been treated successfully and that out-of-town doctors have made frequent use of the service.

H. W. Patterson, Columbus (Ga.) Railroad Company, L. V. Sutton, Carolina Power & Light Company, Raleigh, N. C., and Barron Frederick, Raleigh, N. C., in discussing the use of devices for providing mechanical respiration, favored the prone-pressure method.

Rate Restoration Instead of Rate Increase

Under the heading of "Rate Reduction in the Last Three Years," F. C. Hamilton of the H. L. Doherty Company discussed the rate situation in an interesting way, showing that on account of the reduced purchasing power of the dollar rates for electric service have actually been reduced. In presenting information and statistics on rates and returns from service, Mr. Hamilton called attention to the lack of a standard measuring stick of value and the depreciation of the purchasing power of money and the need of applying a correction factor when the dollar is used to determine present values. The author of the paper therefore maintained that the rates for service of utility companies have been reduced and that in discussing changes in rates to meet present conditions the problem should be considered as a rate restoration instead of a rate increase.

J. Prince Webster, formerly a member of the Railroad Commission of Georgia, presented a brief but concise discussion on methods of handling complaints. He pointed out that the public is generally concerned in the character of service rendered and that its treatment by employees helps to create the general opinion of such service. He referred particularly to the good and bad ways of receiving complaints from customers, giving in detail the impressions that are liable to be created by both ways. In closing he urged that a close study be made of the points of contact with the public and the complaint man be inoculated with the public point of view, always ready to receive complaints with a smile and symapthetic consideration. An investigation and report to the customer should be made on all complaints, accepting censure when due and maintaining that the customer is right until facts prove otherwise.

Grounding of Secondaries

L. V. Sutton, in a paper on the "Grounding of Secondaries," described the function and protection secured from grounding and referred to the recommendations of the National Electrical Code and the requirements of municipal and other regulatory bodies. Under the heading of grounds, the author outlined the common practice in making the actual connections to ground, pointing out that the problem resolves itself into determining what the allowable ohmic resistance of contact and ground conductor may be. This must be determined by the requirements of the particular case. Detailed comparisons of the value of copper plates and iron pipes were given, with the latter ground preferable to the former. Among those who discussed the subject of Mr. Sutton's paper were the following: George C. Estill, President Flanigen, J. M. Barry and N. E. Canady.

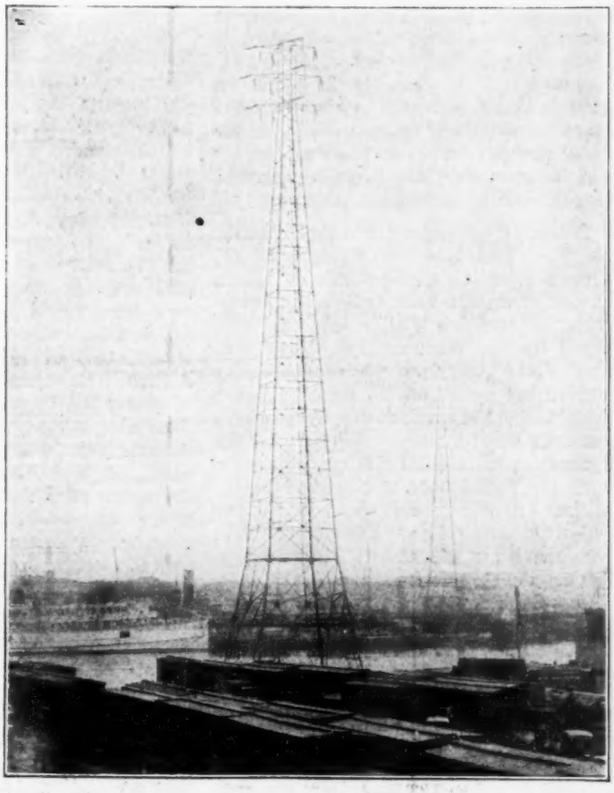
W. M. Stearns of the General Electric Company, in a paper entitled "The Marsh Patent and Its Effect on the Heating Appliance Industry," outlined the features of the nickel-chronium resistance element controlled by that patent and the court proceedings involving the Haskins Manufacturing Company and the General Electric Company. The development of the heating appliance business under the interpretations of the court was also explained and the schedule of prices, as well as the methods of licensing manufacturers to make and sell devices under the Marsh patent.

Election of Officer

At the close of the last session of the convention on Friday morning the following officers were elected: President, P. A. Tillery, vice-president and general manager of the Carolina Power & Light Company, Raleigh, N. C.; vice-president, S. B. Ireland, Montgomery, (Ala.) Light & Power Company; second vice-president, E. A. Cheney, Orlando (Fla.) Water & Power Company.

Special attention was given to entertainment.

Crossing Over Providence River



The 66,000-volt, two-circuit transmission line recently opened between Providence, R. I., and Fall River, Mass., interconnecting the Fall River Electric Light Company's system with the systems of the Narragansett Electric Lighting Company of Providence and the New England Power Company, enables the three systems to coöperate in the efficient use of steam plants, fuel and water.

Current News and Notes

Timely items on electrical happenings throughout the world, together with brief notes of general interest.

Swedish Production of Electrical Manufactures.—Production of "electrical machinery, apparatus and transmission appliances" in Sweden increased from 5,392,000 kronen in 1897 to 104,615,000 kronen in 1917.

Northwestern Ohio Offices Moved.—The Northwestern Ohio Railway & Power Company general offices have now been completely moved from Toledo to Oak Harbor, Ohio. The repair shops are being moved from Genoa to Oak Harbor.

Japanese Wireless Station to Be Built for Communication with America.—The construction of a wireless station to cost 135,000 yen ($67,500) and intended for communication with America has been commenced at the town of Tomioka, Fukashima prefecture, Japan.

Byllesby Bond Department Opens Evansville Office.—The bond department of H. M. Byllesby & Company announces the opening of an office in Evansville, Ind., in charge of F. W. Lauenstein, who has been connected with banking interests in that city for more than fifteen years. This is one of a number of branch offices which will be opened by the bond department as part of its expansion program.

Power Development in Niagara Falls, N. Y.—The Niagara Falls (N. Y.) Chamber of Commerce has issued a pamphlet on the electrochemical industries of Niagara Falls. It was prepared by the Western New York Section of the American Chemical Society and edited by Frank S. Low. It says that "the conservation of our resources demands the fullest development of the hydroelectric possibilities of the nation with the consequent saving and better utilization of our coal deposits." The following data on power development in Niagara Falls are given: First modern power development started Oct. 24, 1890; first power delivered Aug. 26, 1895; amount of first power installation, 100,000 hp.; first user, the Aluminum Company of America, then known as the Pittsburgh Reduction Company. The present power developments are: Canadian, 380,000 hp.; American, 225,000. Under construction, Canadian, 320,000 hp.; American, 100,000 hp. Possibilities for future developments: Estimated total power of river at Niagara, 5,000,000 hp.; estimated possible power development without impairing natural beauty, 2,500,000 hp. This is equivalent to over 16,000,000 tons of coal per annum.

Electricity in Oregon Fruit Packing.—Reports from Oregon indicate that electrical power is being used in increasing quantities in connection with fruit packing. It is stated that electricity is grading and sizing at least 90 per cent of the apples shipped from the Hood River Valley.

Army Signal Corps Needs Men.—Electricians, cable splicers, telephone and telegraph linemen and telephone repairers are much needed by the Signal Corps of the army. As a result a special effort is being made by the recruiting service to secure men who give promise of being able to acquire one of the trades mentioned.

Electricity in Oil Fields.—Operation of oil-well drilling rigs and pipe-line pumping plants by electricity will become general in all the central western Texas fields as soon as the necessary power transmission lines can be built. The Texas Power & Light Company is extending its system of transmission lines to all of the deep sand fields, while the Wichita Falls Electric Light & Power Company will be supplying power soon to most of the territory in and around Burkburnett. The Empire Gas & Fuel Company, which has its principal office at Bartlesville, Okla., has met with such success in experimenting with electric power for drilling wells in the Electra field that it plans to extend this method of drilling.

Omaha Company Urges Public Consideration.—The Nebraska Power Company (Omaha, Neb.) is appealing to its customers through newspaper advertisements for careful consideration of the problems of the company. Facts are stated in a plain manner, with every appeal to the better business judgment of the customer and no appeal to sympathy. In its "Talk to Our Customers, No. 1," the company asks consideration of the load, equivalent to 75,000 electric lamps, being suddenly thrown upon the system on account of a thunderstorm which darkened the skies on the afternoon of Monday, April 21, 1919. Many thousand dollars' worth of machinery, with its attendant labor, fuel and other supplies, must be held continuously in reserve to care for storms which may occur only two or three times a year, so that when a consumer turns a switch electric service will instantly be available.

Federal Tax on All Sales.—The proposal to levy a tax of 1 per cent on all sales of over $1 is not dead. Senator Smoot, as one of the chief advocates of such a tax, is more convinced than ever that it should be resorted to and has announced his intention of taking the matter up vigorously as soon as new revenue legislation is brought up. The plan has many advocates in the House of Representatives, in which the proposal must originate. It will be pushed when the next revenue bill is being formed. Those who oppose the sales tax, however, feel confident that they will be able to defeat any effort to embody it in the revenue bill. When Senator Smoot's attention was called to the unfairness of the proposal in that it imposed a cumulative tax which would amount to from 5 to 10 per cent by the time the ultimate consumer was reached, he declared that one of the reasons he favored the sales tax is because it will discourage the passing of commodities through needless middlemen.

Associations and Societies

A complete Directory of Electrical Associations is printed in the first issue of each month.

I. E. S, New York Section.—November 15 is the date set for the next meeting of this section of the Illuminating Engineering Society.

A. S. M. E., New York Section.—"Industrial Unrest" was discussed by Dr. William M. Leiserson, formerly chief of the Division of Labor Administration, Working Conditions Service, United States Department of Labor, at the Sept. 17 meeting of this section of the American Society of Mechanical Engineers.

Pennsylvania State Association of Electrical Contractors and Dealers.—A quarterly meeting of the association is scheduled for Oct. 7 in Scranton, Pa., with the headquarters established in the Hotel Casey. The tentative program includes luncheon, an outdoor entertainment, the business session and a dinner in the evening, with all branches of the electrical industry invited and represented.

New Engineering Advertising Association in Chicago.—Advertising and sales executives of concerns engaged in the manufacture of engineering products compose the membership of the new Engineering Advertisers' Association of Chicago. Monthly meetings are being planned for the organization, and the improvement of present methods of advertising and selling engineering products will be sought.

Meetings to Be Held During October.—National Safety Council, Oct. 1 to 4, Cleveland; American Electric Railway Association, Oct. 6 to 10, Atlantic City, N. J.; Empire State Gas and Electric Association, Oct. 9, New York City; National Association of Electrical Inspectors, Oct. 13 and 14, Springfield, Mass.; National Association of Railway and Utilities Commissioners, Oct. 14, Indianapolis; Illuminating Engineering Society, Oct. 21 to 24, Chicago; Illinois State Electric Association, Oct. 23 and 24, Chicago.

Recent Court Decisions

Findings of higher courts in legal cases involving electric light, power and other public utility companies.

Utilities Commission Cannot Go Without Its Jurisdiction.—The Public Utilities Commission is without power to prescribe forms to be followed by legislative bodies authorized by law to legislate upon specific subjects and is a board of special and limited jurisdiction without power to exercise any jurisdiction beyond that expressly conferred by statute (City of Washington vs. Public Utilities Commission, 124 N. E 46).

Permitting Excessive Current to Be Conducted Into House of Consumer.—Evidence as to the construction of wires in the alley in the rear of the residence of deceased, from which wires electricity was conducted into the house of deceased, was pertinent to the inquiry as to whether defendant was negligent in permitting an excessive current of electricity to enter deceased's residence (Texas Power & Light Company vs. Bristow, 213 S.W. 702).

Rate-Fixing Ordinance—Definiteness.—An ordinance of the city of Washington enacted to regulate the price chargeable for electric light to private consumers of electricity for light and power, and fixing rates which a gas and electric company and its successors may charge for ten years from a fixed date, was sufficiently definite and certain in its terms to prescribe valid rates, in view of dealings between the parties (City of Washington vs. Public Utilities Commission, 124 N. E. 46).

Death by Shock from Socket Said by Electrician to Be Safe.—Testimony of a witness that he had placed a porcelain socket in residence of deceased and had told plaintiff, deceased's wife, that the socket was safe, and testimony of the wife that she had told deceased just before he attempted to attach electric iron to socket that electrician had told her there was no danger in using it, was pertinent on issue of contributory negligence of both deceased and plaintiff (Texas Power & Light Company vs. Bristow, 213 S.W. 702).

Convenant Not to Sue.—In an action for wrongful death of plaintiff's decedent, who was a telephone troubleman, from an electric shock received from the wires of defendant power company, a stipulation entitled "A Covenant Not to Sue," whereby plaintiff's claims against decedent's employer were released, but especially stating that claims against defendant were not released, was held by the Supreme Court of Missouri (213 S. W. 851) to be a release operating to bar action against all joint tort-feasors, and not a mere covenant not to sue one of them.

Rights of Riparian Owners.—A riparian owner was entitled to have the waters of the lake adjacent to his land stand as they were wont, and not to have his land overflowed more than usual; but, unless such rights were invaded, lower riparian owners on a river flowing out of the lake were entitled to the beneficial use of the stream flowing therefrom, according to the Supreme Court of Michigan (173 N. W. 339).

Testimony Regarding Other Occurrences of Electric Shock.—In action for death of husband due to his receiving electric shock while attempting to connect electric flatiron to socket in his residence, evidence as to electric shocks received by others in their homes a few days before the death of deceased was admissible, electricity being supplied to others through same transformer (Texas Power & Light Company vs. Bristow, 213 S.W. 702).

Fuel Administrator's Orders as Affecting Recovery for Alteration of Electric Signs.—The case of Federal Sign System vs. Palmer (176 N. Y. S., 565) was tried in the court below on stipulated facts, from which it appeared that in February, 1917, the parties entered into an agreement to install and maintain electric signs on defendant's premises. The contract contained a provision that defendant "agrees to pay the company the sum of $56 as deposit and $6.26 each week in advance for the remaining term of this contract as rental for the use of said sign and lighting thereof." There was also a provision that upon breach of the agreement by the lessee the sign company might remove the sign, in which event the lessee should pay $12 for each unexpired month of the term of the contract as liquidated damages. The sign was maintained until January, 1918, when, under order of the federal Fuel Administrator, it was illuminated only on Saturday nights up to March 3, when the order was modified, permitting its use on all nights except Thursday and Sunday. Plaintiff maintained the sign in accordance with the rules of the Fuel Administration until March 29, when the lighting was discontinued upon claim that defendant refused to pay the stipulated rental less a proportionate allowance made for the dark nights. The present action was for recovery of damages stipulated in the contract. Defendant contended that the $56 deposit was to be construed as payment on account for the first weeks of the term, and that as the amount of stipulated rental in arrears amounted to less than that there was no default. The appellate court holds that deposit was to secure defendant's performance of the agreement. Judgment of the lower court is reversed and judgment directed in favor of plaintiff for $237, being the amount of liquidated damages.

Commission Rulings

Important decisions of various state bodies involving or affecting electric light and power utilities.

Economies in Construction.—The Idaho Public Utilities Commission has granted the application of the Mackay Light & Power Company for a certificate of public convenience and necessity to extend electric lines to the village of Arco for the purpose of supplying it with electric power. Its decision is in part as follows: "The applicant owns and operates an electric power plant having a present capacity of about 100 kw., located about 4 miles from the village of Mackay; applicant has made arrangements to build a new plant with a largely increased water head, which when completed will have a capacity of 300 kw.; the maximum capacity required to serve the present demands on applicant's system is 100 kw.; applicant proposes to construct a transmission line of 22,000 volts capacity from its proposed plant to Arco, approximately 26 miles; applicant is able to finance its proposed improvements and construction; the time required to complete such improvements and construction is six months. The village of Arco, intervener, owns and operates an electric light and power plant of about 30 kw. capacity, the motive power being a 37½-hp. oil engine and a distribution system in the village; the applicant has offered to purchase such part of said municipal system as could be used in connection with its proposed service. Intervener admits that its present electric service is inadequate and unsatisfactory and that it is seeking electric energy from some other source. From the standpoint of economy the commission believes the facts all support the Mackay source for energy. The transmission line to Mud Lake (proposed by the village) cannot be built for less than $60,000. The necessary transformer or substation equipment, plus the investment in the distribution system in the village of Arco, will make the necessary total investment, at a very low estimate, $70,000 to furnish the service desired. Intervener's testimony shows that the receipts from the municipally owned plant amount to only $2,701.33 per annum. Depreciation and interest alone on a seventy-thousand-dollar investment, without any allowance for the cost of energy and operating expenses, will amount to over $7,500 per annum. Transmission line and distribution system loss will be considerable, and the present expense of operating and maintaining the distribution system will be very greatly increased by adding a long transmission line and the necessary transformer or substation equipment.

Men of the Industry

Changes in Personnel and Position—Biographical Notes

H. H. Harding has been appointed superintendent of the Hudson (Wis.) division of the Northern States Power Company, succeeding F. Hardwick, who was transferred to the Stillwater division.

H. O. Palmer has assumed the duties of general manager of the Empire Gas & Electric Company at Geneva, N. Y., following the resignation of H. L. Coleman. These duties will be in addition to those of the vice-presidency of the company, which Mr. Palmer has heretofore held.

Clifton R. Hayes, who was elected president of the New England Section of the National Electric Light Association at the New London convention this week, is one of the best known of the younger central-station managers in the Northeast. He was born at Fitchburg, Mass., forty years ago, and was graduated in electrical engineering from the Worcester Polytechnic Institute in 1901. In 1909 he received the professional degree of E. E. from the Institute. His experience has been varied, including electrical engineering in both industrial and public utility organizations before he became manager of the Fitchburg Gas & Electric Light Company at the age of twenty-nine, which post he still holds. Two years of Mr. Hayes' career were spent as assistant to the superintendent of motive power, Worcester Consolidated Street Railway, and for five years he was electrical engineer for the Ludlow (Mass.) Manufacturing Associates. He is a past-president of the Fitchburg Chamber of Commerce, is now vice-president of the Fitchburg Y. M. C. A. and the Fitchburg Rotary Club, and last year was president of the Tenney Service Association, an organization of managers of utilities managed by Charles H. Tenney & Company of Boston. Mr. Hayes has combined to an unusual degree in his executive work at Fitchburg close engineering supervision with a broad commercial policy embodying healthful public relations, and his personal interest in progressive methods in all departments of central-station activity has borne fruit not only in the advancement of the Fitchburg property but in much valuable committee and individual work in the New England Section.

C. R. HAYES

Brigadier-General George H. Harries, head of the American military mission in Berlin and in private life a vice-president of H. M. Byllesby & Company, arrived this week in New York City. General Harries was the first United States officer to arrive in Berlin after the armistice, and from his headquarters in that city has performed an important service to the cause of peace.

Arthur L. Nelson has been appointed instructor in electrical engineering at the Massachusetts Institute of Technology. Previous to this appointment he served as a lieutenant in the engineer corps of the navy. Mr. Nelson was graduated from the electrical engineering course of the Massachusetts Institute of Technology in 1915 and then entered the employ of C. H. Tenney & Company. In addition to his duties at the Institute, where he will give instruction on central stations and distribution systems, Mr. Nelson will devote a portion of his time to consulting engineering work.

C. S. Ruffner, vice-president of the North American Company, with headquarters in New York City, has been elected chairman of the A. I. E. E. committee devoted to the economics of electric service. He is also a manager of the Institute. A biography and photograph of Mr. Ruffner were published in the ELECTRICAL WORLD of Aug. 16, page 379, announcing his recent promotion from vice-president and general manager of the Union Electric Light & Power Company of St. Louis to his present position with the North American Company, which controls the St. Louis company.

W. H. Timbie, well known as an author of books relating to electrical engineering and applied electricity, has been appointed associate professor of electrical engineering in the Massachusetts Institute of Technology. Professor Timbie was graduated from Williams College in 1901. Shortly after he became a teacher of applied science at the Pratt Institute in Brooklyn. Upon the establishment of the Wentworth Institute in Boston he became head of the department of applied science in that institute. During the past year he has been editor-in-chief of the committee on education and special training in the War Department at Washington. He is joint author with Professor Higbie of the University of Michigan of "Alternating Currents" and by himself is author of a book on practical electricity and other books relating to electrical engineering. Certain of these books have been translated into foreign languages. Professor Timbie is a member of the American Institute of Electrical Engineers and the American Society of Mechanical Engineers, has been active in the National Educational Association and has important memberships in other engineering and educational societies. At the Massachusetts Institute of Technology his principal duty will be the supervision of the coöperative course in electrical engineering which is carried on in association with the General Electric Company. This course is arranged so that the students receive a scientific training of very high order in electrical engineering at the Institute and associate with this a training in manufacturing methods and shop management and industrial research at the works of the General Electric Company.

W. H. TIMBIE

Obituary

Stanley A. Smith, superintendent of the Norwalk district of the Connecticut Light & Power Company, died at his home in that place Sept. 1. Mr. Smith was formerly superintendent in New London and later at Waterbury. He went to Norfolk about three years ago.

C. A. Bergen, manager of the Corry City (Pa.) Electric Company and the Union City Electric Company, died Aug. 23. Mr. Bergen was formerly manager of the Stearns Lighting & Power Company at Ludington, Mich., which is affiliated with the Commonwealth Light & Power organization. Previous to that connection he was connected with the Emmanuel properties in Texas.

TRADE & MARKET CONDITIONS

News of the Trade for the Manufacturer, Wholesaler and Jobber of Electrical Equipment and Supplies— Notes on Industrial Activities and Business Methods

TO ELEVATE PLANE OF WASHING-MACHINE BUSINESS

Manufacturers Come Out Against Loose Dealer Practice in Matter of Deferred Payments and Free Trials

There is a definite feeling among electric washing-machine manufacturers that loose merchandising methods of stimulating sales should be discouraged. A very definite stand is being taken on initial and deferred payments and on trials.

At the meeting of the American Washing Machine Manufacturers' Association two weeks ago the sentiment was very strong and resolutions were adopted recommending the discontinuance of bad practices.

Where sales are made on the deferred-payment plan it was recommended that initial payments be at least 10 per cent of the retail cash price before delivery of machine, or in any event not later than the time when a practical demonstration is made. Succeeding payments should be on the basis of completing the transaction within twelve months after delivery of the machine.

It was recommended that the practice of placing machines on free trial before initial payment be discouraged. Where this is impracticable the trial should be limited to a single demonstration and the initial payment secured or the machine removed within three days of demonstration.

With the business such that production is continually behind demand, the manufacturers believe that the time is right to elevate the plane on which the business is being conducted.

STANDARDIZATION OF OUTLET BOX NUMBERING IS APPROVED

Manufacturers Working on New Catalogs—Application of Plan to Other Lines of Electrical Material Is Suggested

The standardized system of numbering outlet boxes and covers, recently adopted by the Electrical Box Section of the Associated Manufacturers of Electrical Supplies, follows the recommendations of the Electrical Supply Jobbers' Association at its Cleveland meeting in 1916. These recommendations were set forth in full in the Nov. 18, 1916, issue of the ELECTRICAL WORLD.

Manufacturers are already at work on new catalogs, to be issued before the end of this year, giving these new numbers. Some manufacturers in their first issue will list the new numbers side by side with their old numbers, in order, they say, to assist the buyer in remembering the new number in place of the old. Other manufacturers expect to use new numbers only, believing that the best way to learn a new number is to forget the old.

Jobbers, contractors and dealers report that there will be much greater ease and facility in ordering stock, checking it and filling orders, and that stock clerks will be able to give better service. Some of these clerks do not know all the different numbers corresponding to the same box and in trying to fill an order will report no stock instead of looking for a corresponding number.

Little difference is said to exist in the product of different manufacturers, and substitution of product is a general procedure in the jobbing and contracting trade. This substitution will be much facilitated under the new system, as jobbers can concentrate on fewer brands and make quicker turnovers.

Some jobbers have already suggested the application of standard numbers to other electrical supplies, referring in particular to wiring devices and schedule material. They believe this would obviate much of the confusion in ordering and stocking of this material.

LAMP SALES SHOW GOOD IMPROVEMENT AND PROSPECTS

Sales to Date 10 per Cent Greater than Last Year—Interest Now Centered in White Lamp Sales, for Which Demand is Heavy

Lamp sales in tungsten vacuum and gas-filled types have been good in the last six weeks and indicate that if the present demand continues the lamp industry will experience a satisfactory season. It is learned that the number of type B lamps turned out in the past year is almost the same as for the previous year, but that sales of these on a dollar-and-cents basis will run approximately 10 per cent more than for the previous year. Although with a few exceptions the prices on the majority of lamps have not been increased, the volume of business for the larger lamps of the gas-filled type has been such that during the past year the sales of this type represent from one-eighth to one-fifth of the total number of lamps sold, which, on account of being high-priced, represent nearly 50 per cent of the lamp business.

Lamp stocks generally are large and will continue to be so for at least two months, although considerable inroads have been made upon them in the past six weeks. The labor situation is generally satisfactory and no serious trouble is threatened, although it is known that some of the smaller manufacturers have had to increase wages several times. It is expected that there will be no embarrassment on account of the shortage in lamp materials such as bulbs, filament wires, etc.

NEW WHITE LAMP SALES AHEAD OF PRODUCTION

The lamp industry seems to be mostly concerned at the present time about the sale of the new white lamp which, although introduced less than two months ago, has attracted a great deal of attention. Manufacturers are inclined to push this line strongly, as it has appeared to meet with favor. According to latest reports, the demands have greatly exceeded production, and the manufacturers are practically sold up on this product. Jobbers and distributers who have not received their stocks will be compelled to get along with a small percentage of what they expected to handle until manufacturers can bring up the production, which up to the present time has run considerably less than the demands. It is a little early to predict the outcome of sales for this lamp, but it is expected that they will be greater than the volume that can be supplied.

As is the case with every new lamp product, a sufficient time has not elapsed to say how the sales will affect the industry. With a given allotment of new lamps of any kind there is a certain percentage of burn-outs, and until sufficient time has elapsed to average these with the long-lived lamps no correct opinion as to the success of the lamp can be given. As is usual, the burn-outs are the first heard from, although it is difficult to know the opinion held by satisfied customers.

During the past year new business, which as a rule repre-

sents 20 per cent of the total volume of sales, has fallen off to some extent, and the slow-up in industrial activity due to the end of the war has caused a lessening in demand for certain types of lamps. In spite of these two factors the lamp business has increased practically 10 per cent over the previous year. With the exception of an increase on Oct. 1, 1918, from 30 to 35 cents for the type B "Mazda" lamp, there has been no increase in prices, with a few minor exceptions in miniature lamps, since Jan. 1, 1918.

The sales of carbon lamps have also fallen off somewhat since the war, but this was expected owing to the amount of temporary construction work of different kinds, for which a more rugged lamp was required. This line, however, at the present time represents a small percentage of the business.

Deliveries on all lamp stock with the exception of the new white light are good, and on account of the exceedingly large stocks there is no apprehension of a shortage this season.

AUTOMOBILE ACCESSORIES AS SUPPLY JOBBERS' SIDE LINE

Sale of Small Number of High-Class Goods on Sole Agency Basis on Which Effort Can Be Con centrated Found Profitable

In the minds of many jobbers of electrical supplies there has been and still is found the question as to what extent they should handle side lines to the electrical trade. The automobile accessory line has proved of much interest in this connection, in that among the strictly electrical material which it embraces may be noted storage batteries, dry batteries, miniature lamps, high-voltage and low-voltage wiring, magnetos, motor-generator sets, meters, spark coils, spark plugs, electric horns, bells and signal systems, and necessary fittings and attachments.

When the automobile business first came into its own most of the accessory business, including both mechanical accessories and the few electrical appliances that were used at that time, was taken over by harness dealers who saw the end of their business, bicycle dealers and hardware stores. Later on, when the electrical supply jobbers saw the future of electrjcal apparatus in the accessory business, they in many cases added this line to their supplies.

In one case alone, where a large jobbing house took over the supply of both electrical and mechanical automobile accessories, it was found that the mechanical end could not be run at a profit, and it was given up. Another prominent jobber in the East soon gave up the line of electrical accessories as a whole and merely concentrated on about three items of electrical accessories.

ACCESSORY SALES NOT INCREASING IN PROPORTION TO REGULAR BUSINESS

The electrical automobile accessory supply business as handled by the electrical jobber has not grown in proportion to the electrical jobbing business as a whole, supply men state, and many electrical jobbing houses which had taken on this line have discontinued it. On the other hand, some jobbers have gone into this business in a manner which has brought them success, and they intend to continue it along those lines. If the electrical business is to be covered in its entirety, a very wide distribution of sales must be made. In the first instance, the average dealer in automobile accessories of all kinds was in many instances the type of man without a sense of responsibility to his customer or to his jobber. Credits were lax and business methods poor. In later years, however, the character of the average automobile accessory dealer has risen to such a level that both his credit system and his methods of doing business are on an entirely new plane and provide much less risk to the jobber than heretofore.

The sale of miniature lamps has fallen away from the electrical jobber to a great extent. A representative jobber has stated that only 10 per cent of the miniature lamps are distributed by electrical-supply jobbers. Automobile accessory jobbers distribute 60 per cent. Dry batteries, although they are not now used so universally for automobile work, have found their way into hardware channels and are distributed to a great extent through hardware jobbers.

One of the more successful electrical automobile accessory lines has been found to be the storage battery. A prominent jobber who had little success with electrical accessories as a whole concentrated on one representative make of storage battery and a few other items and has worked out of it a very successful branch of his business. The auto-accessory end of his business has been operated as a separate company and has established many service stations throughout its territory. This, it seems, is one line of the business which should be kept strictly in the electrical field. The secret of success in this case has been the acquisition of a small number of accessories in which exclusive agencies could be taken, so that there will be no chance for price cutting on the same commodity by unscrupulous distributers. In addition, the character of the goods was such as put them on a par with the other electrical goods sold by that distributer in the course of his regular business. In the automobile trade the cutting of prices on the same goods sold in the same territory by different distributers has made the better class of jobber unwilling to compete under those circumstances and has led him to seek a sole agency for a high quality of apparatus, on which all effort could be concentrated.

POLE MARKET IS FAIR WITH GOOD DELIVERIES

No Advance on Cedar Poles Since the 10 to 15 per Cent Increase Made on July 1, While Chestnut Varieties Show Slight Variation—Business Increasing

Quotations on cedar poles have not advanced since July 1, when they went up 10 to 15 per cent. The Northern and Western varieties were advanced at different times and announced from different localities, but the majority of the lists were effective about that time. It is believed that this new list will continue until the first of the year without any considerable change.

Cedar stocks are low, and if the demand should increase to large proportions, some sizes will run out. There probably will not be many more poles of the Northern cedar taken out before winter, although there will be some. With the Western cedar the situation is slightly different, as poles are hauled during the off season of the year, and as a result the pole prices naturally respond more quickly to variations in labor scales. Although stocks are low, deliveries of 500 miles in a week can be made on cedar poles at the present time by several large concerns.

There has been no general increase in the price of chestnut poles, although there have been some variations, according to the grade of pole ordered. The stocks held are fairly large and prompt deliveries are being made. Orders are being handled promptly, and as a rule the poles are en route within two or three days of the time the order is placed.

GOOD CEDAR POLE SEASON

The season just closed was far better than the previous one as regards the sale of cedar poles. A number of reports show a variance, but the majority indicate that shipments on this variety were better this season than last one. However, the comparison with regard to chestnut poles does not show up quite so well but indicates that the sales for the past season are below a pre-war normal year. Generally speaking, there are no large individual orders reported, but the majority of the orders are of a fair size or made up of a large number of small orders.

In other lines, such as those for creosoted pines, the demand has been curtailed by the plant prices of poles. It has been estimated that the demand is about one-third off the normal pre-war years. Naturally the prices are especially sensitive to a change in the labor market on account of the amount of labor necessary to prepare poles for the creosoting process. In addition to the added labor cost, the price of creosote has advanced in about the same proportion as labor. On account of the war the creosote

which usually was imported from Germany, England and Japan, was gradually cut off. Of the total of 80,000,000 gal. used annually in this country it is estimated that half came from these three countries. On account of a large demand and excessive ocean freight rates, the supply is not nearly up to normal.

There is a great deal of restlessness and general inefficiency being shown which has the effect of creating a labor shortage in the pine-producing belt, where most of the work is done by negroes. This has also had its effect upon the prices of the creosoted pine poles, so that unless more favorable circumstances come about a general advance in the market is looked forward to throughout the rest of the year.

CHINESE IMPORTATIONS OF ELECTRICAL MATERIALS

Examination of Customs' Returns for 1918 Indicates that the United States Is Enjoying a Large Percentage of this Market

By an examination of the Chinese customs returns for 1918 it is found, according to a report from Consul-General Thomas Sammons, that the gross imports of electrical materials and fittings into China for that year amounted to 4,307,551 taels ($5,138,708 gold). Of this amount articles to the value of 174,357 taels ($213,587 gold) were reëxported abroad. The importation of materials of this nature was divided among countries as follows:

TABLE I—ELECTRICAL IMPORTS INTO CHINA

	Value, Taels	Approximate Percentage
Great Britain	250,418	5.8
France	1,307	....
Italy	8,981	0.2
Japan	2,300,110	53.4
Philippine Islands	1,091	....
Canada	273,113	6.3
United States	873,545	20.3
Hongkong	371,467	8.8
Russia	214,559	4.9
Total	4,294,591	99.7

In addition to the above, articles to the value of 12,960 taels ($15,876 gold) were imported from Macao, French Indo-China and Korea.

The above returns, when compared with the year 1917, including Belgium, show the following:

TABLE II—COMPARISON OF CHINESE ELECTRICAL IMPORTS FOR 1917 AND 1918

	Increase, Taels	Decrease, Taels
Great Britain	.....	129,275
France	.....	21,238
Belgium	.....	7,597
Italy	.....	9,039
Japan	.....	253,447
Philippine Islands	741	.....
Canada	214,172	.....
United States	.....	35,415
Hongkong	.....	9,820
Russia	190,958	.....

In 1916, with Germany and Belgium eliminated, the percentages were as follows:

TABLE III—CHINESE ELECTRICAL IMPORTS IN 1916

British Empire (including colonies)	31
Japan	47
United States	17
Other countries	5

A glance at the foregoing percentages of sales will show that Great Britain, because of shipping difficulties and exigencies of war, has dropped back in her percentage of sales, while both Japan and the United States have greatly improved their place in the Chinese electrical market.

THE WEEK

IN TRADE

BUSINESS in the electrical field seems to be running at high speed regardless of local labor troubles. Stocks are being depleted, and deliveries show almost no improvement.

With the steel strike now in progress, no improvement can be expected in the supply of iron and flexible conduit and other iron and steel electrical products.

Prices generally are the same, with occasional local advances.

New building is going forward and, with the Chicago carpenters' strike over, a bigger demand for wiring material for this section can be expected to follow.

NEW YORK

Satisfactory business rules in the entire district. Emphasis is being laid on winter material and attachment and wiring devices for household appliances. Orders for these appliances are heavy for the holiday trade, and apparently much effort is being placed on this class of business.

In some sections jobbers are laying in extra stocks of electrical material in the belief that transportation will be bad later in the year and that factory shipments will lengthen. The latter condition is already affecting stocks.

Building continues in good volume in the residence class, although few large commercial undertakings have been noted recently. Real estate men are buying up all available old houses in suburban sections and wiring them for electric service, laying special emphasis on attractive and effective lighting fixtures and not neglecting utility outlets.

Collections as a whole are shown to be satisfactory, and some jobbers are active in asking even quicker payments. Contractors' accounts are better. Utility collections are longer than the others.

STEEL POLES.—Domestic ordering is light considering the season. Export orders and inquiries are much better. Shipments are rather quick. Prices run from 5 cents to 6 cents a pound.

HEATERS.—Projector heaters are listing around $11 and $12 and are beginning to move from jobbers' stocks. Orders on manufacturers are in the neighborhood of 25 to 50 per cent of the size of orders last fall.

ATTACHMENT PLUGS.—Sales on separable plugs are heavy.

FLATIRONS.—Improvement in sales is reported and factories are rushed to meet requirements. Prices on the 6-lb. iron range from $6.75 to $7.50.

INDUSTRIAL TRUCKS.—Demand is principally for factory work and is fair. Steamships and docks are placing some business, but it is light, and railway orders are lacking. Two-ton trucks sell around $1300 to $2200.

FLEXIBLE ARMORED CONDUCTOR.—Shipments to jobbers are reported better, but large stocks cannot be accumulated. An average price for No. 14 single strip is $80 in 1000-ft. lots and $90 to $95 in less than 1000-ft. lots.

WIRE.—Rubber-covered base is holding on 30 cents. No. 14 is still behind on factory shipments, and jobbers' prices are given around $11.75 to $12.50 per 1000 ft.

REFLECTORS.—Ivanhoe metal reflectors and fittings advanced in list price about 10 per cent Sept. 5, while discounts on less than standard packages decreased 5 points, and on more than one standard package 1 point.

CONDUIT.—Demand is increasing and supply is coming through in better shape.

CHICAGO

The jobbers and dealers of Chicago still have their hands full of business, but they experience increasing difficulties in getting new stocks. Even stable lines such as sockets, wire, conduit and switches have to be ordered two or three months in advance by the jobbers. Electrical work of all kinds is being carried on in territory outside of the city of Chicago, a large part of it being in wiring homes and small plants. In Chicago construction is practically dead. The carpenters won in their strike for $1 per hour, and $100,000,000 of construction will be resumed as soon as union difficulties with the trade are settled. Hydroelectric companies in Illinois and Michigan are still suffering from lack of water, although the rains of the present week promise some relief. Plans are being drawn up for extensive electrical developments in the copper mines of the Michigan peninsula. Among the equipment which will be installed are turbines up to 20,000 kw., transformers, transmission lines, underground locomotives and pumps. Electric hoists will be introduced into the district for the first time in a large way. A 33,000-volt transmission line will be built to connect the Interstate Light & Power Company with the Lena Electric Light & Power Company, near Apple River, Ill., a distance of about 10 miles.

WIRE.—Prices remain firm, with 30 cents base for rubber-covered, weatherproof from 28 cents to 31 cents, according to the amount of stock on hand, and about 28 cents for bare wire. The smaller sizes are still hard to obtain.

SCHEDULE MATERIALS.—The demand for house wiring is still heavy. Factory deliveries have not improved. Generally speaking, stocks are not being replenished fast enough to keep up with the demand.

PORCELAIN CLEATS.—Stocks are short, and factory shipments are slow. The demand for the out-of-town construction is large. Cleats are quoted at about $15 per 1000 net.

KNOBS.—Stocks of knobs are also short, and deliveries do not meet the demand. The current price is from $12 to $23 per 1000 net.

RANGES.—The demand has not as yet built up to what it was before the recent price advance, although back orders are still keeping factories busy.

SOCKETS.—Stocks are very low, particularly the pull sockets. The price of the ½-in. cap pull socket is 54 cents, net, in standard-package lots; of the keyless sockets, 26 cents, and of the key sockets, 30 cents.

OUTLET BOXES.—The smaller standard sizes are very scarce on account of the demand for home-lighting equipment.

BATTERIES.—Stocks are good, and prices are steady, under a stiff demand. The No. 6 battery ranges in price from 45 cents each to 34 cents in barrel lots.

BOSTON

Business activity is increasing and little outward evidence exists at this writing of the labor difficulties of the past fortnight. Deliveries of schedule material are increasing somewhat in length. Porcelain is getting scarce, and conduit prices are being subjected to cuts under close competition. Recent price advances in electric tableware seem not to have affected the demand. For the most part prices are firm, with occasional softening tendencies. Collections are fairly good and stocks are being maintained with difficulty, barring heavier construction material. Building is going forward well. Engineering firms and electrical contractors are very active. House wiring has been retarded for the time being by the linemen's strike, about 600 applications for service being held up in this district. Boston remains calm under military policing, and there has been no interruption of electrical service.

WHITE-BULB LAMPS.—A heavy demand continues for 50-watt units. Local stocks are being depleted. Price at retail is 65 cents.

RADIATORS.—Increased demand is reflected in jobbing circles. Acute competition is evident, the newer designs stimulating this. Popular types are selling for about $11. Many jobbers have laid in good stocks in anticipation of a big fall business.

WIRE.—Prices hold steady at 30 cents base on rubber-covered wire, No. 14 selling at $11 per 1000 ft., net. Weatherproof is quoted at 29 cents base, and bare at 27 cents. The demand is good for nearly all sizes, but No. 14 wire and magnet wire are scarce. Annunciator wire sells for 50 cents a pound. It is hard to get, and further advances in cotton-covered wire are feared.

CLEATS, KNOBS AND TUBES.—This material is short. Unglazed cleats are easier at $13.65 per 1000 ft., net; "Nail-it" knobs are higher, at $16.50, and 3-in. tubes are bringing $5.50 per 1000 net.

FRICTION TAPE.—In 100-lb. lots this is selling around 44 cents in the standard black, ¾-in. width. The supply is plentiful.

FLATIRONS.—The demand is steady, regardless of price changes. The manufacturers are hard-pressed to fill orders.

COUPLINGS.—Black couplings, ½ in., are easier at 8 to 9 cents, the 1-in. size selling for 12 cents each.

RIGID CONDUIT.—The uncertain steel situation is upsetting prices. Recent quotations were 15.5 cents net per ft. for 1-in. black pipe and 70 cents net on 3-in.

SOCKETS.—Prices are steady, case lot quotations being: Key, 24.75 cents; keyless, 22.5 cents; pulls, 45 cents. Switch discounts are about 17 per cent off list in standard packages.

MOTORS.—A healthy trade in motors up to 50-hp. rating is noted. The smaller sizes are a bit hard to obtain promptly.

FLEXIBLE ARMORED CONDUCTOR.—Single-strip, No. 14, brings $80 to $85 per 1000 ft. and is hard to get at that. In ½-in. to 1-in. sizes list less 20 per cent is being charged for flexible metallic conduit.

WASHERS.—The acute domestic labor situation is stimulating enormous sales.

PORTABLE RANGES.—Summer camps in the Connecticut valley have absorbed over 100 of these, especially the two-burner size, which advanced from $27.50 to $30 list recently.

ATLANTA

Underlying conditions point to a continued active trade in the electrical merchandise field and allied lines. Manufacturers are feeling the effects of an increased fall demand for lamps and material in season. Although the jobbers have been passing through a period of price uncertainty, they have settled down to the inevitable and are buying in more liberal quantities, realizing that shipments are growing longer each day. There has been more or less unfavorable comment on the price advance on electric ranges and other heating appliances, but, on the other hand, the final user is complaining very little. The demand for labor-saving devices is breaking all records, and jobbers and dealers have no little difficulty in keeping suitable stocks. Electrical contractors and dealers state that collections are well above the average. The labor situation with contractors is comparatively easy in this section since a combination of open and closed shop conditions exists. It is reported that some large construction jobs are planned, awaiting a settlement of the steel labor trouble. Building in general is intensively active, covering residences, apartments and business structures.

LAMPS.—Trade in all types is brisk, and the stocks which have accumulated during the off-season are ample to take care of the growing fall demand. Factory shipments, too, are exceptionally good. It appears that Southeastern stocks are in better shape than ever before. The call for miniatures is steadily increasing. The demand from rural sections is much bigger than last year.

BELLS AND GONGS.—Business recorded so far this year is greater than ever experienced in this section because

of the building boom. Stocks are almost normal on the standard lines.

FIXTURES.—Manufacturers have great difficulty in supplying the jobber demand. The higher-priced fixtures are growing more popular. Prices on glassware are somewhat unsettled.

FLASHLIGHTS.—Every one is enjoying a good business. This week registered an increased demand. Stocks are in good condition, but there is a perceptible slowing up in battery shipments. Jobbers are quoting 40–10 off on "Daylo" complete with batteries, with ten or more unbroken unit packages.

CONDULETS.—The movement is brisk, following the trend of black rigid conduit. Shipments are spotty, but in the general average are fair and keeping well up with the market requirements. Jobbers quote 30 off on standard packages and over.

DRY BATTERIES.—Trade is very active, and substantial orders are being put through. Temporarily stocks are low. Factory shipments in isolated cases are promised for five weeks. We quote jobbers' prices net per 100 f.o.b. Atlanta, on regular No. 6, in lots of 125, $35; No. 6 ignitors, $36; the same, f.o.b. New Orleans, $33.60 and $34.60.

FUSE PLUGS.—The market is strong. Stocks are in excellent condition. Prices remain easy. We quote jobbers' price net each on 3-amp. to 30-amp., 125-volt, in lots of 500 and over, 5 cents.

ENTRANCE SWITCHES.—On the whole, the volume of sales is heavy and a few jobbers report a phenomenal trade. We quote jobbers' price on 100 and over, double-pole, 65 cents each; Square D safety, lots of 200 and over, $1.61 net.

NON-METALLIC FLEXIBLE CONDUIT.—Shipments from factory are poor in the face of a growing demand from all sources. We quote jobbers' price per 100 ft. on $\frac{5}{8}$-in., in amounts $150 to $300 list, $3.30; $\frac{1}{2}$-in., same quantity, $3.03.

SEATTLE—PORTLAND

Strikes and lockouts still prevail in Seattle, and as the result commercial activities are far below normal. Electrical jobbers report that sales during the past week were less than for the preceding week, and present indications are that they will show further decreases. The strike of the building trades is further from settlement than ever. Stocks of electric grills and other electrical table utensils are practically depleted as a result of the Seattle gas strike. Lumber mills in western Washington and western Oregon are moving within 25 per cent of their normal volume of business, and the industry generally is producing within 7 per cent of its normal output.

The Board of Public Works, Seattle, is calling for bids until Oct. 3 for construction of an additional electrical unit to the city's steam plant, and until Oct. 17 for furnishing the hydroelectric machinery involved in the construction of an additional unit to the Cedar Falls station.

The Portland territory reports that business continues good. Architects are busy with plans, some of which are for projects of considerable importance. Manufacturers report a very marked movement in general wiring materials, due largely to activity in residential and public garage construction.

Building permits for the month of August surpassed those issued for any month in the past five years. September bids fair to be another record month. The power companies have been increasing their orders for meters with local stocks short, and in some instances it has been necessary to delay installations for new customers for several days.

Business in retail stores is excellent. One large electrical appliance store reports a 40 per cent increase for the month of August over the same month last year. The principal activity was in washing machines, electric ranges and percolators. Jobbers report stocks of electric appliances low and predict an actual shortage by the first of the year.

SAN FRANCISCO

Despite labor unrest and the state of uncertainty, business continues to hold its tremendous pace. Not since the rebuilding of San Francisco in 1906 have architects and contractors been so busy, and this condition is state-wide. Some record-breaking crops are reported.

BOXES AND COVERS.—All local stocks have been depleted by the last quarter's demands, and the prospect of a protracted and bitter steel strike is causing anxiety. Prices have recently increased about 10 per cent, standard round or octagon boxes and their plain covers now selling for 20 cents and 11 cents each, respectively, in lots of 100.

INSULATORS.—Porcelain strain insulators have increased again, for the fourth time this year, the small eggs selling at about 9 cents each and the large ones at 14 cents each. No definite line can be secured on the larger-line types, except that the call is scanty and varied. Such large jobs as there have been and the Great Western Power, San Joaquin and Southern California Edison orders have totaled over $500,000.

TAPES.—Commercial-quality friction tape is selling in 50 lb. lots for about 67 cents a pound, the biggest orders coming from shipyards. There is little call for light 1-ounce or 2-ounce or 4-ounce rolls.

CROSS-ARMS.—The Northwestern mills can now make better deliveries, but the demand is little bettter than in 1918. Higher costs of handling in labor and transportation have necessitated a 10 per cent advace.

SEWING MACHINES.—Increased sales are recorded.

METAL MARKET SITUATION

Copper Quiet with Still Lower Offerings by the Outside Market than Have Obtained

The copper market has become really more quiet than in the previous week. The threatened steel strike has probably put a damper on buying, although it has had no effect on producers' prices. These are still holding at 23.50 to 24 cents, depending upon month of shipment. The outside market has even receded $\frac{1}{4}$ to $\frac{3}{8}$ cent, to 21.75 to 22 cents a pound, and buyers have evinced little interest in the lower prices. These prices hold for delivery during any month of the present year, showing no customary increase per month for succeeding months.

Buying of copper wire and other wire products is heavy both for domestic and foreign consumption. Orders are continually increasing, and there is more evidence of taking prices of the material in accordance with the price of the copper contained therein. This, of course, has some effect on the time of booking orders.

The scrap-lead market showed a slight advance following the advance of new lead a week ago. The scrap brasses suffered a decline of $\frac{1}{4}$ cent to $\frac{1}{2}$ cent, without doubt because of the disposition of a large amount of government stocks.

NEW YORK METAL MARKET PRICES

	Sept. 15	Sept. 22
Copper:	£ s d	£ s d
London, standard spot	101 0 0	100 5 0
	Cents per Pound	Cents per Pound
Prime Lake	22.62½	22.62½
Electrolytic	22.12½	22.12½
Casting	21.50	21.50
Wire base	26.00	26.00
Lead, trust price	6.25	6.25
Antimony	8.50	8.50
Nickel, ingot	41.00	41.00
Sheet zinc, f. o. b. smelter	10.50	10.50
Spelter, spot	7.55	7.37½
Tin	56.50	56.50
Aluminum, 98 to 99 per cent.	32.00 to 33.00	32.00 to 33.00

OLD METALS

	Cents per Pound	Cents per Pound
Heavy copper and wire	19.00 to 19.50	19.00 to 19.50
Brass, heavy	10.00 to 10.50	10.00 to 10.50
Brass, light	8.50 to 9.00	8.50 to 9.00
Lead, heavy	5.00 to 5.10	5.00 to 5.10
Zinc, old scrap	4.75 to 5.00	4.75 to 5.00

NEW APPARATUS & APPLIANCES

A Record of Latest Developments and Improvements in Manufacturers' Products Used in the Electrical Field

Screw-Plug Flush Receptacle

In connection with its No. 600 screw-plug flush receptacle, which has just been approved by the Underwriters' Laboratories, the Gordon Electric

DIRECT CONNECTION BETWEEN SCREW SHELL AND SCREW-SHELL TERMINAL

Manufacturing Company of Waterville, Conn., calls particular attention to the original method of assembling the screw shell and also of getting the direct connection from the screw shell to the screw-shell terminal. This construction requires no connectors of any kind, as the current is carried directly to the terminal connection. This is declared to prevent any possibility of a poor connection or possible "shorting" of the receptacle due to loose connectors or parts. The heavy-weight solid-brass plates supplied with these receptacles are also a feature.

Storage-Battery Hand Lantern

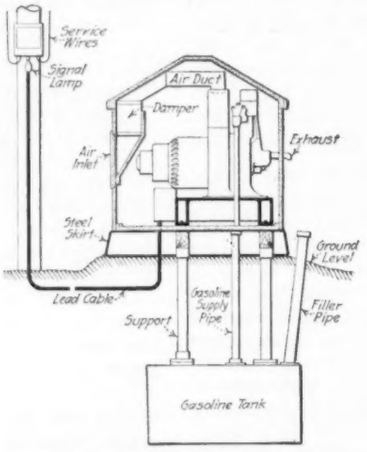
A "Steelite" electric hand lantern which resembles the dry-battery type but which instead is equipped with a storage battery that can be charged through an automatic charging panel contained in the lantern has recently been developed by the Inland Electric Company of 15 North Franklin Street, Chicago.

The battery, it is claimed, is not harmed if overcharged, undercharged or charged with reversed polarity. It can be charged over and over again by removing the top of the lantern case, setting the charging screw, closing the switch and connecting a direct-current lighting circuit with the charging panel which forms the top of the battery. In this operation no current passes through the lamp.

The battery case, which is finished in baked-on mahogany enamel, is of pressed steel and has both a large adjustable bail and a strong handle at its back. A large reflector with a concave-convex bull's-eye directs the rays from the special lamp bulb, the light being controlled by a switch at the back of the lantern.

Farm Power and Light Plant with Outdoor Housing

A new lighting plant, the "Sunnyhome," has recently been developed by the Sunnyhome Electric Company (division of the General Motors Corporation) of Detroit, Mich. This plant is completely inclosed in a small steel house which is insulated for cold weather and may be placed out of doors. A reinforced-steel gasoline tank is the foundation for the whole plant so that no concrete foundation need be constructed for the house. Inside the house the rubber-jar storage batteries are mounted in stout wooden boxes so that glass jars, battery racks on walls and battery wiring are done away with. The plant automatically starts up when battery recharging is necessary and is automatically stopped when this is completed. Should the



DESIGNED FOR OUT-OF-DOORS

gasoline be exhausted a signal light in some convenient place is lighted.

The engine of the plant is a 2½-hp., single-cylinder, four-stroke-cycle type, air-cooled, with a heavy flywheel, with forced lubrication. It has a constant speed of 2000 r.p.m. The generator is two-pole, direct-current, 110 volts, rated at 1250 watts, with a "booster" to keep the lights steady. Drive is direct, through flexible coupling. The storage battery contains fifty-two cells.

Small Steam Turbo-Generator Lighting Plant

For lighting small industrial plants, small steamboats and other places using steam and where the illumination requirements are small the Buda-Ross steam turbo-generator is being manufactured by the Buda Company, Railway Exchange Building, Chicago, in ½ kw. and 1-kw. sizes. It is pointed out that these sizes are unusually small for steam turbo-generator plants.

In the construction of the plant the steam turbine and the electrical generator have been built compactly into one unit. Speed is controlled by an automatic governor and the field coils of the generator have a compound winding. This makes the operation of the plant entirely automatic, requiring no other attention than turning on the steam when the lights are needed and turning off the steam when they are no longer needed.

Volt-Ammeter for Signal System Testing

For maintenance work on signal systems the Roller-Smith Company of 233 Broadway, New York City, has developed "Handy S. S." type direct-current volt-ammeters. These instruments are small and compact enough to fit in the pocket or in a tool kit and with one exception are self-contained. They have been designed to withstand considerable abuse without loss of accuracy. While the scales of the new volt-ammeters are shorter than those used in the "portable standard" type instruments made by this company, they are said to meet in a most satisfactory manner the needs of the maintenance man.

These instruments can be had with full-scale readings as low as 1.5 volts or as high as 300 volts. Full-scale current readings as low as 0.150 amp. or

COMPACT AND PORTABLE

as high as 30 amp. may be secured. It is possible by using different terminals to secure different full-scale readings of voltage and current.

The mechanism of the new instruments is of the same type as in the "portable standard" instruments so that scale divisions are uniform and indications dead-beat. The cases are brass stampings of waterproof construction finished in black enamel. There is a wood plate on the bottom of each instrument's base for insulation purposes. The terminals are numbered with non-removable tops. Each instrument has a zero adjuster and may be supplied with a leather carrying case if desired.

Electrolytic Rectifier for Battery Charging

An outstanding advantage of the "Ab-rec" storage-battery charging rectifier, pointed out by its maker, the American Battery Company, 1132 Fulton Street, Chicago, is that without any change it can be operated on any alternating-current circuit of from 50 to 125 volts with any frequency, including 25 and as high as 140.

The rectifier, which is of the electrolytic type, charges 6, 8, 12, 18 or 20-volt batteries. It is automatic in operation, since there are no regulating appliances. Nor does it have any moving parts, magnets or bulbs to burn out. The two small electrodes, which are gradually consumed, and the fluid are the only parts of the rectifier, the maker states, which have to be renewed. The fluid is made by dissolving a powder in pure water.

When charging a 6-volt battery the rectifier passes into it a current of 2 amp., and when charging a higher voltage battery the current is somewhat less. A discharged lead battery of any ordinary ampere-hour capacity may be recharged over night, it is claimed, while one of large capacity requires a longer period.

Electrically Operated Carpet Washer

With the electrically operated carpet washer just developed by the Hamilton-Beach Manufacturing Company of Racine, Wis., carpets are not taken up, leaving the floors bare, but are left in position when washed and, it is said, are ready for use within two hours.

NO WATER TOUCHES CARPETS

No water touches the rug or carpet. Instead a warm "sudsy" cleaning compound is scrubbed down to the bottom of the nap, thereby, it is claimed, cleaning every fiber thoroughly and taking out all the dirt or grit.

Two brushes, made of soft, yielding rubber, are oscillated by an electric motor 500 times a minute, thus, the maker declares, duplicating the scrubbing motion of the human hand. The soap compound which is used by the carpet washer is said to contain no harmful chemicals or animal fats.

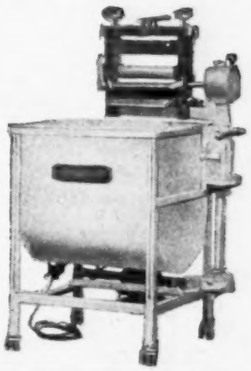
R. L. M. Standard Lighting Reflectors

A line of R. L. M. (reflector and lamp manufacturers) standard lighting reflectors has been brought out by the Vitreous Enameling Company of Cleveland, Ohio. They are made in sizes for 75, 100-150, 200, 300-400-500, and 750-1000 watt lamps and have diameters of 12, 14, 16, 18 and 20 in. (30, 35, 40, 45 and 50 cm.) respectively. Porcelain enameled green is the outside finish of the reflectors, the inside being white.

INDUSTRIAL LIGHTING REFLECTOR AND LIGHT DISTRIBUTION CURVE

Cylinder Clothes Washer with Adjustable Wringer

Safety of operation has been an important consideration in the design of the "Harmony" electrically operated clothes washer and wringer, which is now being made by the Clark-Cadle-Harmon Corporation of Rochester, N. Y. All working parts of the machine are inclosed; the washer cannot be started until a safety lever has been depressed, and the machine can be stopped instantly by a single move of this starting lever; the wringer has a safety stop, which prevents it being started unless locked in position, and a safety release at the wringer's top relieves the load if clothes become clogged in the rolls.



CYLINDER REVOLVES SIX AND A HALF TIMES IN EACH DIRECTION.

The new washer is run by a ¼-hp. Westinghouse "splash-proof" motor especially built for washing-machine service. The washing cylinder is white cork pine with four ribs on its inside to keep the clothes in motion in the soapy water. This cylinder is revolved six and a half times in each direction, and as the clothes are lifted up by the ribs, they drop, thus causing a compression from their own weight without any outside force.

Eleven-inch (28-cm.) rubber rollers are used in the swinging wringer, which is adjustable and locks in five different positions. The new washer may be had with a galvanized tub, the whole machine being finished in white enamel, or with a polished copper tub.

Notes on Recent Appliances

Conduit Attacher

The C. C. Korns Company of Johnstown, Pa., has developed fittings for attaching conduits to structural steel work.

Refillable Plug Fuse

A plug fuse of the refillable type has been placed on the market by the Efficiency Electric Company of East Palestine, Ohio.

Oil Switches for Outdoor Circuits

Several improvements have been incorporated in the R. C. and O. C. type of oil switches for the remote control of outdoor lighting circuits. These switches are made by the South Bend Current Control Company, South Bend, Ind.

Adjustable Electrolier Switch

An adjustable electrolier switch for selectively controlling the different lamps in a room has been placed on the market by the Arrow Electric Company of New York and Chicago.

Violet-Ray Machine

The Contra-Pole Electric Company, 1227 Prospect Place, Brooklyn, N. Y., has developed its No. 500 violet-ray machine.

Reverse-Phase Relays

Two types of reverse-phase relays have been developed by the Over States Machine Company, 103 Park Avenue, New York City, for protecting alternating-current motors against phase reversal, phase failure and low voltage.

Manufacturers' Activities

THE WARD LEONARD ELECTRIC COMPANY of Mount Vernon, N. Y., has appointed Lyman C. Reed, 821 Union Street, New Orleans, La., as its selling agent in that territory.

THE ECLIPSE VALVE GRINDER COMPANY, manufacturer of electrically driven valve grinders, is now quartered in the Terminal Railway Building, Twentieth Street at Pope, Kansas City, Mo.

THE HEARNEN STORAGE BATTERY COMPANY, Trenton, N. J., has completed negotiations for the acquirement of the plant and property of the Charles W. Carll Company at West Front and South Warren Streets, to be used for a new establishment.

C. H. NORWOOD, contracting electrical and mechanical engineer, has moved his offices to 116 West Illinois Street, Chicago, and has incorporated his business as the C. H. Norwood Company. James E. Noonan has become a member of the firm. The company will continue to furnish electrical and mechanical equipment for all types of moving bridges.

THE WORTHINGTON PUMP & MACHINERY CORPORATION has purchased the plant, patterns, accounts, patents and other assets of the Epping-Carpenter Pump Company, located at Pittsburgh, Pa. The plant will be operated as the "Epping-Carpenter Works." Orders and contracts now in hand will be completed by the Worthington Pump & Machinery Corporation, and all further business will be for its account.

THE RICHARDSON-PHENIX COMPANY, Milwaukee, Wis., announces that L. E. Strothman, who for several years has been manager of the steam-turbine and pumping-engine departments of the Allis-Chalmers Manufacturing Company, left that firm on Aug. 15 to become vice-president and general manager of the Richardson-Phenix Company, in which firm he has acquired a financial interest. In making the change J. William Peterson becomes president and treasurer of this firm. Mr. Strothman is well known in manufacturing circles, having been connected with the Allis-Chalmers Company since 1902 and

L. E. STROTHMAN

prior to that with the Filer & Stowell Company and the Nordburg Manufacturing Company. He is a member of the American Society of Mechanical Engineers, having held the chairmanship of the Milwaukee Section during 1915 and 1916. In 1916 he was appointed an associate member of the Naval Consulting Board by Josephus Daniels, Secretary of the Navy. In 1918 he was made a member of the main committee of power test codes and elected chairman of the sub-committee of displacement pump tests. Mr. Strothman is also a member of the American Society of Civil Engineers and the American Water Works Association.

THE AMERICAN INSULATION COMPANY, Roberts and Stokley Strets, Philadelphia, will represent the Philip Carey Company in the Philadelphia district in all Carey lines.

THE E. B. BADGER & SONS COMPANY, Boston, manufacturer of spray washers, cooling towers, etc., has opened an office in Chicago with Harry E. Wheeler as manager.

J. H. PARKER & SON, INC., porcelain manufacturers, have opened a New York office at 50 Church Street, with J. W. Tompkins as manager. The Trenton office has been discontinued.

THE KELVINATOR CORPORATION, manufacturer of electric refrigerating machines, has opened a new office and display room at 8 Adams Avenue, West Detroit, Mich. Thomas J. Moran is manager of the Detroit sales office.

THE PAGE & HILL COMPANY, Minneapolis, Minn., has purchased a new Browning 15-ton locomotive crane for use in its Minnesota transfer yards. The crane will be used in the handling of poles at the butt-treating plant and for car loading.

BUSCH-SULZER BROTHERS.—The Diesel Engine Company, St. Louis, Mo., announces that it has opened an Eastern sales office at No. 60 Broadway, New York, in charge of George D. Pogue, Eastern sales agent, and Stanley Wright, assistant.

THE EMERSON ELECTRIC MANUFACTURING COMPANY, St. Louis, Mo., is now listing 25-cycle and 30-cycle "I-R type" single-phase motors in ½, ¾, 1 and 1½-hp. sizes. Previously only 60-cycle motors were listed. The ½-hp. and 1-hp sizes are carried regularly in St. Louis stock.

THE YOUNGSTOWN SHEET & TUBE COMPANY, Youngstown, Ohio, has issued the first number of the *Youngstown Sheet & Tube Bulletin*, dated Aug. 15, 1919. Among the figures given on estimated maximum capacities for the production of materials in the plant, electrical conduit (steel) is set down at 30,000 tons and flexible-steel armored cable at 36,000,000 ft.

THE AMERICAN STEEL EXPORT COMPANY, Woolworth Building, New York City, announces the establishment of a new raw-materials division under the management of A. A. Schneider. This department will have supervision not only over all imports and exports but also of domestic sales of pig irons, manganese, chrome and low phosphorous iron ores, ferro-alloys, coal and coke.

G. P. GOODMAN, who for several years has represented the Hisey-Wolf Machine Company in the East, will join F. H. Niles & Company, Inc., on Oct. 1, to take charge of their portable-tool department. F. H. Niles & Company handle not only the Hisey-Wolf line of electric machine tools but the Canton pneumatic hammers and drills manufactured by the Pittsburgh Pneumatic Company in the East. Other changes in the Niles company are the appointment of F. H. Crawford as secretary and J. E. Haetten as sales manager.

JOHN J. CARRICK, who has become identified with Paul W. Koch & Company as sales engineer, was for three years in the electrical department of the Lincoln Park Commission, when the construction of the power plant and underground cable systems for boulevard and park lighting was under way. After this he was for five years with the Cutter Electrical & Manufacturing Company of Philadelphia as sales engineer in its Chicago office. During the war he served in the United States Navy, attaining the rank of lieutenant, senior grade.

THE EDISON ELECTRIC APPLIANCE COMPANY, Chicago, is making an effort to educate dealers to anticipate their requirements and place their orders sufficiently far enough in advance to enable the manufacturer to produce the goods in time for early delivery. The company states: "Almost over night we have been called upon to double, and in some instances even treble, our output, to take care of this unusual demand. It is difficult to meet a sudden increased demand such as this, because it takes time to secure quantities of raw material. Skilled help cannot be quickly obtained because of the uncertain labor market."

E. M. CUTTING, formerly Western manager of the Edison Storage Battery Company, has been appointed manager of the railway department with headquarters at the factory, Orange, N. J. In 1888 he commenced working for the Southern Pacific Company in its signal department and in 1897 was promoted to be supervisor of the Western division of the road. In 1905 he received charge of the electric lighting of the passenger-train cars of the system still retaining the position of signal supervisor. Three years later he was appointed engineer of train lighting, heating and ventilation of the entire system. He resigned from the Southern Pacific Company Dec. 31, 1912, to become manager of the newly created Western branch of the Edison Storage Batteary Company.

E. M. CUTTING

Supply Jobbers' Notes

THE UNITED ELECTRIC SUPPLY COMPANY, Boston, Mass., has recently installed a complete fixture studio and appliance department.

THE PERRY-MANN ELECTRIC COMPANY, INC., Columbia, S. C., has recently let a contract for the addition of three floors to its warehouse, totaling something over 13,000 sq.ft.

F. W. SWAYZE, who was first employed in the auditing department of the Western Electric Company and has been in the employ of the company since 1904, is Eastern district manager, line-material department.

THE MATTHEWS ELECTRIC SUPPLY COMPANY, Birmingham, Ala., has recently purchased for $75,000 a four-story and basement building, 55 ft. by 182½ ft. It has also increased its sales force from four to seven salesmen.

THE MANHATTAN ELECTRICAL SUPPLY COMPANY, New York City, announces the appointment of H. G. Anschuetz as general purchasing agent, vice Charles E. Merrill resigned. Mr. Anschuetz was formerly in the sales department.

THE ELECTRICAL SUPPLY COMPANY, New Orleans, La., has found it necessary to lease the building adjoining its present premises and will obtain occupancy Oct. 1. This will give the company virtually double its present floor space.

THE PENN ELECTRICAL ENGINEERING COMPANY, Scranton, Pa., has appointed Frederick C. Crarer manager of the electric appliance department. Mr. Crarer has been connected with the Syracuse (N. Y.) Lighting Company as assistant commercial agent and advertising manager.

THE FORT WAYNE OIL & SUPPLY COMPANY, Fort Wayne, Ind., is now operating its electrical department under the name of the Luxam Electrical Supply Company, with A. T. Clifford as manager. These changes have been made to further the interests of this department. There is no change in ownership, management or policies. A catalog covering the electrical line has recently been issued.

H. J. GORKE, INC., Syracuse, N. Y., has put on an extra salesman this fall with a view of covering the territory more closely rather than increasing in territory. This company has also taken on a new line of Sangamo meters.

Foreign Trade Notes

AMERICAN TELEPHONES FOR NORTHERN EUROPE.—The Copenhagen Telephone Company has just placed orders for two automatic telephone exchanges from the Western Electric Company, according to advices received from Denmark. This, it is reported, will be the first introduction of an American telephone system in northern Europe, where Germany and Sweden formerly enjoyed a monopoly in this trade. The two telephone exchanges will cost about 4,000,000 kroner (more than $1,000,000) and can take care of 10,000 subscribers. During the war Denmark suffered from a serious shortage in the supply of telephones and telephone materials. Thousands of persons were compelled to do without telephones, and private subscribers having telephone service often sold it at increased prices to business men.

INTERNATIONAL RELATIONS OF THE G. E.-THOMSON-HOUSTON INTERESTS.—The wide ramifications of the Thomson-Houston interests throughout the world render it desirable to draw attention to an important statement made in the course of the annual report of the Compagnie Française pour l'Exploitation des Procédés Thomson-Houston, which was presented at the recent general meeting and reported in the London *Electrical Review*. It is necessary first to recall briefly a little from history. Under the original agreements by which the founders of the French company—the Thomson-Houston International Company and the General Electric Company—divided their patents and rights between the various subsidiaries which they established in Europe, the Compagnie Française had to limit its activity to France, Italy, Spain, Portugal, Greece and Egypt. The absorption of the German Thomson-Houston Company by the A. E. G., which took place in 1903, disturbed this organization and compelled the French company to come to terms in Italy and Spain, which, even if they had not been applied improperly by the French company's co-contractors, were to constitute a new limitation of the action of the Compagnie Française in those countries. At the annual meeting of the latter company in 1915 the directors announced their irrevocable decision to regard these conventions with the German company as null and void and to resume their complete freedom of activity in all the countries concerned by the agreements. Since then the French law of Jan. 21, 1918, and more recently the peace treaty conditions, confirm by legal means the cancellation of the arrangements. The question now arises whether the American company could permit a German company to remain as licensee of its rights and continue to work them in countries which are still bleeding from enemy exactions or permit the old and respectable name of Thomson-Houston to remain coupled with their firm. On this point the report states that agreements are in course of preparation for the redistribution among the subsidiaries of the General Electric Company in allied countries in Europe of the rights which were originally granted to the Germans, and if it would be premature for the moment to say in what form and measure this will take place, the directors remark that it is certain at least that the new arrangements will represent an expansion of the French company's rights and of its influence in territories which have hitherto been closed to it, to say nothing of those which have been returned by the victory. The French company has already acquired control of the Société des Etablissements Carels Frères of Ghent, which undertaking is destined to become the pivot of a Thomson-Houston Belge, which in turn is to be created in coöperation with American, Belgian and French interests. The General Electric Company recently dispatched a mission to the French company composed of engineers who are experts in all branches of the electrical industry, with its applications to mining, textile mills and hydro-electric works, the last branch of which is to be greatly developed in France in the near future. The success of the mission, the chairman informed the shareholders at the Paris meeting, has exceeded all expectations, thanks to the sympathy shown between the Americans and the French engineers.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered, further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number.

Cable quotations f.o.b. New York are desired by a man in Australia (No. 30,599) on two steam hammers of 3000 lb. blow for driving wooden piles and two electric pile-driving winches for the same purpose.

A company in China (No. 30,588) desires to purchase generators, magnetos and motors. The generators and magnetos are needed for immediate use. Quotations should be given c.i.f Hongkong. Terms, cash against documents.

Etablissements Arbel, 24 Rue du Rocher, Paris, France, requests catalogs, prices and information on electric motors, hoists and traveling cranes. It is contemplating the reconstruction of the destroyed plants of an important French firm of steel manufacturers.

The development of new coal mines is planned by the government of a country in the Far East (No. 30,609), and the chief engineer desires to receive catalogs of electrical transmission machinery. A complete list of what will be required may be obtained on application to the bureau or its district offices.

The electrical engineering department of a municipality in South Africa (No. 30,566) requires different kinds of electrical supplies, such as twin-conductor lead-covered cable, triple concentric cable, boiler tubes, centrifugal pump and motor, recording ammeters, single-phase transformers, sundry supplies, etc. Inquiry forms and blueprints were forwarded and may be examined at the bureau or its district offices. (Refer to file No. 123,150.) Tenders should be forwarded by mail at the earliest possible moment, so that they may arrive by Oct. 1, 1919, if possible.

Trade Publications

ELECTRIC VIBRATORS.—The Hamilton Beach Manufacturing Company, Racine, Wis., has issued form 511 to show and describe its electric massage vibrators.

ELECTROCARDIOGRAPHIC EQUIPMENT.—Charles F. Hindle, 106 East 126th Street, New York City, has issued an illustrated booklet describing his electrocardiographic equipment.

BATTERY-CHARGING RECTIFIERS.—The General Electric Company of Schenectady, N. Y., has issued a booklet called "Tungar Sales Talks" for the use of those interested in the sale of these rectifiers for charging automobile starting and lighting batteries.

ELECTRIC BUFFING, POWER AND GRINDING MACHINES.—The LeBron Electric Works of Omaha, Neb., are circulating a leaflet telling about their electric buffing, power and grinding machine and their combination buffer and compressed-air outfits.

AUTOMATIC HOT-AIR STERILIZERS.—The H. G. Weeks Manufacturing Company of Hamilton, Ohio, has issued a booklet telling about its electrically heated automatic hot-air sterilizers for doctors, dentists, oculists, surgeons, laboratories and soda fountanis.

OIL SWITCHES AND CIRCUIT BREAKERS. — The Condit Electrical Manufacturing Company of South Boston, Mass., is circulating bulletin No. 413-2 descriptive of its type E-3 oil switches and circuit breakers. This publication supersedes Bulletin No. 413.

ASH DISPOSAL.—The American Steam Conveyor Corporation of 326 West Madison Street, Chicago, and 110 West Fortieth Street, New York City, is circulating a mailing folder entitled "A Pertinent Ash-Pile Question," explaining the advantages of its steam ash conveyor.

TRANSPORTATION MACHINERY, METALLURGICAL EQUIPMENT AND POWER MACHINERY.—The Wellman-Seaver-Morgan Company of Cleveland, Ohio, has published an interesting illustrated booklet, entitled "What We Do," in which some of its electric ore unloaders, cranes, hydraulic turbines, hoisting and mining machinery and coke-oven machinery are shown.

ELECTRIC ARC WELDERS.—A number of different electric arc welders are covered in bulletin No. 700 issued by the United States Light & Heat Corporation of Niagara Falls, N. Y.

ICELESS REFRIGERATORS. — The Kelvinator Corporation of Detroit, Mich., has issued several mailing circulars and folders telling about its new iceless electric household refrigerator.

PORTABLE MOTION-PICTURE PROJECTOR.—A thirty-two-page publication has been issued by the DeVry Corporation of Chicago, Ill., to explain the advantages, uses and construction of its portable motion-picture projector.

INDUSTRIAL LIGHTING SYSTEM.—The "Sampson Axcess" system of industrial lighting is described in an illustrated booklet recently issued by the Axcess Electric Manufacturing Company, 434 Union Street, Lynn, Mass.

LOW-VOLTAGE SHUNT-WOUND DYNAMO.—The W. Green Electric Company, 81 Nassau Street, New York City, has issued a circular telling about its type 18 and 18A low-voltage shunt-wound electric dynamos for small and medium work.

CENTRIFUGAL PUMPS. — Centrifugal pumps for irrigation and general utility use are the subject of bulletin No. 11 which has recently been published by the Pelton Water Wheel Company, Harrison and Nineteenth Streets, San Francisco, Cal.

ELECTRO-MEDICAL MACHINES. — Bulletin No. 80 from the Wappler Electric Company, 173 East Eighty-seventh Street, New York City, is descriptive of its "Telatherm" and portable "Telatherm," which are electro-medical high-frequency machines.

New Incorporations

THE VAUGHNSVILLE (OHIO) ELECTRIC LIGHT COMPANY has been incorporated with a capital stock of $5,000 by B. G. Slusser.

THE CHALFONT (PA.) ELECTRIC COMPANY has been incorporated with a capital stock of $5,000 by J. C. Murtagh of Philadelphia, Pa.

THE WASHINGTON TOWNSHIP LIGHT COMPANY of Allentown, Pa., has been incorporated with a capital stock of $5,000 by E. M. Walter.

THE NEW BRITAIN ELECTRIC COMPANY of Chalfont, Pa., has been incorporated with a capital stock of $5,000 by J. C. Murtagh of Philadelphia, Pa.

THE JUSTUS (OHIO) LIGHT & POWER COMPANY has been chartered with a capital stock of $2,500 by C. B. McClintock, W. Savage, Ray Fisher, Walter Brown and George W. Kalp.

THE AMERICAN ELECTRIC SERVICE & MAINTENANCE COMPANY of Springfield, Mass., has been incorporated with a capital stock of $50,000 by Alfred M. Scofield of Springfield, Edward C. Young and Oliver M. Young of Newtown.

THE BRIDGEPORT ELECTRIC PRODUCTS, 481 North Washington Street, Bridgeport, Conn., has been organized with a capital stock of $16,500 to manufacture electrical specialties. Robert Liddell is president and C. E Bilton secretary.

THE COLEMAN LAMP COMPANY of Los Angeles, Cal., has been incorporated by W. C. Coleman of Del Mar, C. B. and Floyd Cole of Los Angeles. The company is capitalized at $20,000 and proposes to manufacture lighting fixtures, lamps, etc.

THE MILNER FLOWER ELECTRIC COMPANY of Buffalo, N. Y., has been incorporated with a capital stock of $30,000 by C. B. McBride, M. W. Bense and Allen E. Moore, 37 Wall Street, New York, N. Y. The company proposes to manufacture electrical apparatus.

THE OIL BELT POWER COMPANY of Concord, N. H., has been incorporated by Joseph W. Worthen, Robert C. Murchie and M. Nelson of Concord. The company proposes to generate and distribute electricity for lamps and motors, to deal in electrical machinery and supplies and also to supply natural and artificial gas.

THE BUCKEYE ELECTRIC MOTOR COMPANY, 220 Huron Street, Toledo, Ohio, has been incorporated by H. H. Donnelly, H. M. O'Toole, J. J. Ankenbrandt, Frank Eichert and Lee Regan. The company is capitalizd at $10,000 and proposes to repair starting and lighting equipment on automobiles, repairing motors, etc.

New England States

ATTLEBORO, MASS. — The Municipal Council has approved the installation of an ornamental lighting system in the business district, consisting of sixty-four lamp standards mounted with 600-cp. lamps.

FALL RIVER, MASS.—The Fall River Electric Light Company has petitioned the Board of Gas and Electric Light Commissioners for authority to increase its capital stock from $2,100,000 to $2,855,999, the proceeds to be used for reducing floating indebtedness and to pay for additions and extensions.

NEW BEDFORD, MASS.—Considerable new electrical equipment will be required in connection with the proposed new hotel to be erected by the New Bedford Hotel Company at Middle, Pleasant and Foster Streets, to cost about $750,000. Clinton & Russell, 32 Nassau Street, New York, N. Y., are architects.

PEPPERELL, MASS.—Plans are under consideration for the erection of a new electric transmission line extending from the line of the New England Power Company, running from Nashua, through Dunstable, to a point near the bridge in Pepperell, to connect with the present line now furnishing electricity for the Nashua River Paper Company.

Middle Atlantic States

CENTRAL ISLIP, N. Y.—Contract has been awarded by the State Hospital Commission to Benjamin Rayner, Locust Avenue, Islip, for the construction of the proposed new power plant at the Central Islip State Hospital. The cost of the plant with equipment is estimated at about $150,000.

LINDENHURST, N. Y.—The Lindenhurst Manufacturing Company is planning to discontinue its steam generating plant and will equip its entire plant with electrically driven machinery.

LONG ISLAND CITY, N. Y.—Contract will soon be awarded by the Lehigh Silk Hosiery Company, 220 Fifth Avenue, New York City, for the erection of a factory on Suydam Street, between Wykoff and Irving Avenues, to cost about $1,000,000. Ballinger & Perrott, 47 West Thirty-fourth Street, New York City, are architects and engineers.

MACEDON, N. Y.—The village of Macedon has applied to the Public Service Commission for permission to maintain and operate an electric lighting system for other than municipal purposes. On June 30 the town voted to acquire the local electric plant for $2,500 and $4,000 for improvements. It is proposed to equip the plant to furnish electricity for power purposes.

NEW YORK, N. Y.—The city is planning to build a new power plant at the Fordham Hospital. The cost of the building is estimated at about $5,000.

PORT CHESTER, N. Y.—Large quantities of electrical and mechanical equipment will be required in connection with the proposed new plant of the Mint Products Corporation, 949 Broadway, New York City, to be erected at Port Chester. The cost of the factory is estimated at about $350,000.

ROCHESTER, N. Y.—Arrangements have been made by the Rochester Folding Box Company, Elizabeth Avenue, for an addition to its plant, to cost, with equipment, about $200,000.

ROCHESTER, N. Y.—The General Railway Signal Company, Lincoln Park, is contemplating building an addition to its plant and also a loading platform, to cost about $115,000.

TALCVILLE, N. Y.—The St. Lawrence Transmission Company of Potsdam has purchased the rights of A. J. McDonald in the Freeman talc mines and contemplates extensive improvements, involving an expenditure of about $60,000. New conveying and crushing machinery and electrically driven units will be installed.

UTICA, N. Y.—The plans for the new vocational school to be erected by the board of education on Mohawk Street, at a cost of about $300,000, provide for industrial shops. E. J. Berg, 223 Elizabeth Street, is architect.

BUTLER, N. J.—The Borough Council is having plans prepared for the installation of a new electric lighting system along Carmonton Road in the Bloomingdale section.

Construction

News of Projects, Plans, Bids and Contracts. Notes on Work Under Way

INTERCOURSE, PA.—The Intercourse Electric Light, Heat & Power Company is planning to change its plant from a three-wire, three-phase, 2300-volt delta system to a four-wire, three-phase, 4000-volt grounded neutral system (Delta-Star). This will necessitate some changes at the Paradise substation and the erection of about 20 miles of No. 6 copper wire. The Paradise substation receives its energy at 11,000 volts from Lancaster. Enos L. Zimmerman is general manager.

PHILADELPHIA, PA. — Arrangements have been made by the Hale & Kilburn Corporation, Eighteenth and Lehigh Streets, for the erection of an addition to its plant, to cost about $100,000.

PITTSBURGH, PA.—Plans are being prepared by the Grant Garage Company for the erection of a new repair shop and automobile service station at First Avenue and Grant Street, to cost, with equipment, about $100,000. C. J. Rieger of Pittsburgh is architect.

PITTSBURGH, PA.—Plans have been filed and contract awarded by the Duquesne Electric Company for the erection of a new two-story substation, 62 ft. by 92 ft., at Forty-eighth and Butler Streets, to cost about $45,000. The H. Kerr Company, 2565 Fifth Avenue, is contractor.

POLK, PA.—Bids will be received by the board of trustes of the State Institution for Feeble-Minded of Western Pennsylvania at Polk until Oct. 8 for furnishing a motor-driven low-service centrifugal pump and liquid-chlorine machine with platform scales. Specifications may be obtained from Chester & Fleming, engineers, Union Bank Building, Pittsburgh, upon deposit of $10. Marvin F. Scaife is secretary of the institution.

ANNAPOLIS, MD.—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., in the near future, under Specification 4026, for an addition to power house and ash bunker at Annapolis, Md., to cost about $96,000. A deposit of $10 will be required for plans.

RICHMOND, VA.—Contract has been awarded by the Southern Stove Works to the Austin Company, Bullitt Building, Philadelphia, Pa., for the construction of a new plant, to cost with equipment about $500,000.

WASHINGTON, D. C.—Bids will be received at the office of chief of engineers, Procurement Branch, Equipment Section, Troop Division, Washington, D. C., until Oct. 1, for furnishing two 5-kva., 60-cycle, single-phase, subway-type transformers and two controlling panels with accessories.

WASHINGTON, D. C.—Bids will be received at the office of chief of engineers, Procurement Branch, Equipment Section, Troop Division, Washington, D. C., until Oct. 7 (advertisement 18) for furnishing six 15-in. to 21-in. fans with 110-volt, 60-cycle, single-phase motor; six 21-in., same as above, and two 21-in., same as above.

WASHINGTON, D. C.—Bids will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., for furnishing at the various navy yards and naval stations supplies as follows: Until Sept. 30, Mare Island, Cal., Schedule 4618—sixty testing generators and 100 ventilating sets; Schedule 4619—miscellaneous plate carbons, glass tube fuses and fuse wire; Schedule 4620—miscellaneous cotton sleeving and insulating tape; Schedule 4625—insulating fiber, hard rubber and sheet leatheroid. Until Oct. 3, Mare Island, Cal., and Puget Sound, Wash., Schedule 4625—170,000 insulated staples, 60,000 porcelain knobs, 15,500 porcelain tubes, 12,000 porcelain cleats, 500 galvanized bushings, 20 outlet boxes and 1000 knockout boxes; Schedule 4634—vibrating bells and buzzers; Schedule 4635—fuse blocks and inclosed fuses. Mare Island, Cal., Schedule 4636—300 cut-outs for panels and miscellaneous switches; Schedule 4637—miscellaneous lamp sockets; Schedule 4638—3000 shade holders, 16,500 attachment plugs, miscellaneous receptacles, 5000 fuseless rosettes and 410 plug clusters. South Brooklyn, N. Y., Schedule 4646—Sixty-two automatic relays. South Charleston, S. C., Schedule 4647—324,000 lb. carbon electrodes and 17,280 lb. connecting pins. Until Oct. 14, Key West, Fla., Schedule 4640—1640 ft. steel wire cable. Application for proposed blanks should designate the schedule desired by number.

North Central States

DETROIT, MICH.—The Hudson Motor Car Company, Jefferson Avenue, is contemplating the construction of a new plant for the manufacture of its Essex automobile, to cost about $2,250,000, of which $1,000,000 will be used for machinery and equipment.

DETROIT, MICH.—Contract has been awarded by the Anderson Electric Car Company to H. G. Christian, Stevens Building, for the construction of a new five-story plant at Aberle and Russell Streets. The company manufactures the Detroit electric automobile.

DETROIT, MICH. — Heads of various city departments using electric energy were authorized by the municipal electric plant and City Council to submit estimates of their needs for the next twenty-five years to the Public Lighting Commission. The figures will be used in planning expansion of the municipal power station on Atwater Street on a twenty-five year basis. For expansion of the plant and construction also of a high-pressure pumping station for the Fire Department it is proposed that the city fill in along the river front out to the harbor line. This will supply space for the installation of five high-pressure pumps, each of which will have a capacity of 3000 gal. per minute at 300 lb. pressure. Two units will be built in 1920, two in 1921 and one in 1922. Frank R. Mistersky is superintendent of the Public Lighting Commission.

FLINT, MICH.—The Champion Ignition Company is contemplating extensions to its plant, including machine-tool equipment, to cost about $100,000.

KALAMAZOO, MICH.—At the election to be held Nov. 4 the proposal to issue $1,269,000 in bonds for extending the municipal electric light plant so that it may develop sufficient electricity for domestic, commercial and municipal purposes will be submitted to the voters.

REED CITY, MICH.—The Osceola Light & Power Company is planning to install an auxiliary plant. The company, it is reported, has placed orders for engines and boilers for same. As soon as the addition is completed the company, it is said, will submit an offer to the City Council for pumping the city water.

ST. JOSEPH, MICH.—Plans have been completed by the Auto Specialty Company for the construction of four new buildings at its plant, to cost, including equipment, $100,000. Davidson & Weiss, 53 West Jackson Boulevard, Chicago, Ill., are architects.

CLEVELAND, OHIO. — The Western Electric Company, 413 Huron Road, contemplates the erection of a new warehouse and office on Carnegie Road, to cost about $125,000.

CLEVELAND, OHIO.—Contract has been placed by the Cleveland Tractor Company for the construction of two buildings, one, 182 ft. by 440 ft., to be used as an engine shop, and the other, 90 ft. by 190 ft., as a heat-treating department. George S. Rider & Company are engineers.

CLEVELAND, OHIO. — The Cleveland Railway Company, it is reported, will receive bids about Sept. 30 for construction of a single-track electric railway on Ridge Road from Dennison Avenue to Big Creek, a distance of 3 miles, to cost about $200,000. A. McKay is chief engineer.

DAYTON, OHIO.—The Gem City Ice Cream Company, 1005 West Third Street, contemplates extensions to its plant, including the installation of a 180-ton Hardwick ice machine and electric motors.

EATON, OHIO. — Ground has been broken for the foundation for the substation to be erected at the north corporate limits of the city by the Eaton Lighting Company. An electric transmission line is being erected from Greenville to Eaton to supply electricity to the local company for distribution.

GREENVILLE, OHIO.—Bonds to the amount of $45,000 have been voted for the installation of a municipal electric light plant and waterworks system.

HAMILTON, OHIO.—Work has started on an addition to the power plant of the Hooven, Owen, Rentschler Company. The company contemplates an addition to its machine shop later on.

LA GRANGE, OHIO. — Bonds to the amount of $20,000 have been authorized for the installation of an electric lighting system in LaGrange.

RICHWOOD, OHIO.—The capital stock of the Richwood Light, Heat & Power Company has been increased from $20,000 to $40,000.

CARROLLTON, KY.—At the general election to be held Nov. 4 the proposal to issue $25,000 in bonds for improvements to the municipal electric light plant and waterworks system will be submitted to the voters.

MAYSVILLE, KY.—The City Council is considering the question of establishing a municipal electric light plant.

NEWPORT, KY.—The City Council is considering the installation of a municipal electric light plant to supply electricity in Bellevue, Dayton, Fort Thomas, Highlands District, Clifton and Southgate. Joseph Hermann is city commissioner.

AETNA, IND.—The Aetna Iron & Steel Company, recently incorporated with a capital stock of $2,000,000, has purchased the site of the Aetna Explosive Company, consisting of 400 acres, on which it proposes to erect a new plant. A building, 600 ft. by 350 ft., will be erected. The plant to start with will consist of six mills and a blast furnace. Gary capitalists are reported interested in the project.

INDIANAPOLIS, IND.—Extensive improvements are contemplated by the Interstate Public Service Company, involving an expenditure of about $350 000, and which will include the purchase of steel coaches and the erection of a new central shop, to cost about $100,000. It is proposed to establish a uniform voltage of 600 to take the place of the present voltage system of 1200 to 600.

CHICAGO, ILL.—Plans are being prepared by the Hamler Boiler & Tank Company, 3908 South Halsted Street, for an addition to its plant, to cost about $50,000. The plans provide for a new power plant.

CHICAGO, ILL. — Contract has been awarded by the Wahl Company, 1800 Roscoe Street, to R. C. Wieboldt for the erection of a five-story addition to its plant. The cost is estimated at about $450,000.

CHICAGO, ILL. — Contract has been awarded by the Knight Light & Soda Water Company, 351 West Chicago Avenue, for the erection of two buildings at the corner of North Kildare and Schubert Avenues, to cost about $150,000.

CHICAGO, ILL.—Bids, it is reproted, will soon be received by L. G. Hallberg & Company, architects, 116 South Michigan Avenue, for the construction of a factory on Ohio Street and Spaulding Avenue for the Wilson-Jones Loose Leaf Company, 3021 Carroll Avenue, to cost about $400,000.

CHICAGO, ILL. — Contract has been awarded by the Whitman & Barnes Manufacturing Company, 1000 West 120th Street, for the construction of a new power house, to cost about $19,000, to Stone & Webster, 38 South Dearborn Street. The company has also engaged Stone & Webster to prepare plans for extensions to its plant, to cost about $1,000,000.

HARTFORD, WIS. — Plans are being prepared by Cahill & Douglass, architects, Gross Building, Milwaukee, for a new power plant for the city, to cost between $50,000 and $60,000.

MILWAUKEE, WIS.—Steps have been taken by Erwin C. and Joseph E. Uihlein and others to organize a new company to be known as the Diversified Food Products Company. Plans are being prepared by A. W. Hoffman, engineer, for the proposed plant, which will be located on the Port Washington Road, near the old cement mills. The main building will be 88 ft. by 376 ft.; a power house, box factory, garage, warehouse, gatehouse and sewage-disposal plant are included in the plans.

OSHKOSH, WIS.—Preliminary plans are being prepared for the erection of a factory building for the Bulldog Tractor Company, to cost about $750,000. A. H. Gruenwald, 24 Washington Street, is manager.

OSSEO, WIS.—The City Council is considering the purchase of the local electric light plant and also the installation of a waterworks system.

ELKHART, KAN.—Work has begun on the erection of the proposed new power house for the municipal electric light plant and waterworks system. Bonds to the amount of $60,000 were voted for extensions to the plant. Contract has been awarded to the Western Electric Company of Kansas City for the installation of an ornamental lighting system on three blocks in the business section of the town.

Southern States

MURPHY, N. C.—The town of Murphy is installing a new electric light plant. The cost of the plant is estimated at about $50,000.

SOUTH CHARLESTON, S. C.—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., in the near future, for furnishing at South Charleston, under Specification 4032, motors and controllers for cranes.

VARNVILLE, S. C.—The installation of an electric light plant in Varnville is under consideration. F. L. Moxon is reported interested.

ROME, GA.—Plans are under consideration by the Fairbanks Company, 416 Broome Street, New York, N. Y., for the erection of an addition to its local plant, to cost about $100,000. A new engine house will also be built.

FLORENCE, ALA.—Bids will be received at the United States Engineer Office, Florence, Ala. until Oct. 15 for furnishing and erecting three steel traveling-tower derricks.

PINE BLUFF, ARK.—The Missouri & Southeastern Utilities Company is contemplating the construction of a new steam-driven power plant in this section; also an electric transmission system with local distributing lines.

NEW ORLEANS, LA.—The New Orleans Railway & Light Company is planning to lay a new cable across the river to replace the one at Louisa Street, which was broken several weeks ago. The cost is estimated at about $10,000.

ENID, OKLA.—The Enid Pipe Line Company is contemplating the construction of a new power plant. The company also is considering the erection of houses for employees and other improvements.

OKLAHOMA, OKLA.—Plans have been completed by the Oklahoma Railway Company for the reconstruction of its terminal station at Oklahoma City. The cost is estimated at about $250,000.

PONCA CITY, OKLA.—Extensions are contemplated to the municipal electric light plant, to cost about $25,000.

TULSA, OKLA.—The Oaklahoma Gas & Electric Company of Oklahoma City has petitioned the Commissioners of Tulsa County for permission to extend its electric transmission lines from Kiefer to Bixby and thence to Jenks to serve electricity to those towns. The cost of the proposed line is estimated at about $70,000. The Oklahoma company, it is reported, is contemplating the construction of a power plant on the Arkansas River at Jenks, to cost about $3,000,000.

ALBANY, TEX.—Arrangements are being made for the installation of an electric light plant in Albany for which a franchise has been granted. An ice factory, it is understood, will be built in connection with the proposed electric plant.

BRYAN, TEX.—At an election held recently the proposal to issue $75,000 in bonds for the purchase of property of the Bryan Power Company was carried. New machinery, to cost about $30,000, will be installed in the plant.

LUFKIN, TEX.—The installation of an ornamental lighting in the downtown business district is under consideration.

Pacific and Mountain States

MONTESANO, WASH.—The generator at the plant of the Northwest Electric and Water Works in Montesano, was recently destroyed by an explosion.

SEATTLE, WASH.—The City Council has passed an ordinance appropriating $432,000 for preliminary work at the Skagit River power site. The money will be used to build a road, 28 miles long, from Rockport to Gorge Creek, at a cost of $250,000, where it is proposed to locate the first units of the plant. A construction power plant and a portable sawmill will be installed at a cost of about $200,000. The initial installation at Gorge Creek will develop 45,000 hp., which can be increased to 68,000 hp. by the construction of the Ruby Creek Reservoir to increase the water storage.

TACOMA, WASH.—Frank Mason, president of the Mason County Power Company, has advised Fred Shoemaker, commissioner of finance, that a contract has been awarded for the first development on his power site on the Snokomish River, below Lake Cushman. The Mason Company claims to have certain rights which the city must have to develop the Lake Cushman site.

FLORENCE, ORE.—The electric plant of the Florence Electric Company at the mouth of the Siuslaw River was recently destroyed by fire, causing a loss of about $10,000. The town is at present without electrical service. G. G. Bushman is president and manager.

GRANT'S PASS, ORE.—The California-Oregon Power Company is planning to extend its high-tension transmission line from Medford to Roseburg, where, it is understood, it will connect with the Umpqua power system, thus connecting all power stations between Roseburg and San Francisco.

PRINEVILLE, ORE. — Bonds to the amount of $150,000 have been voted to complete the municipal dam and power system.

MODESTO, CAL.—Arrangements are being made by Modesto and Turlock Irrigation Districts of Modesto for a bond issue of $609,000 for the construction of a new hydroelectric power plant to develop about 40,000 hp.

NOVOTA, CAL.—The State Railroad Commission has granted the Novota Utilities Company permission to issue $3,000 in notes for improvements to its system.

PASADENA, CAL. — The Warnerlite Company of Davenport, Iowa, has engaged W. P. Sheperd and Herbert A. Eamm, architects, Central Building, Pasadena, to prepare plans for its proposed new plant to be erected on South Marengo Avenue, to cost about $100,000. The company manufactures lighting plants and electric automobile equipment.

RICHMOND, CAL.—The Pacific Oil & Lead Company is planning to install electric motors and operating machinery.

MISSOULA, MONT. — The Missoula Light & Water Company is planning to remodel its power dam in the Missoula River near Milltown, at a cost of about $85,000.

Canada

BRANTFORD, ONT. — The Slingsby Manufacturing Company is contemplating the purchase of a 150-kw. to 200-kw., 60-cycle, 550-volt generator.

PICKERING, ONT.—The Hydro-Electric Power Commission of Ontario, it is stated, is willing to equip the old Toronto & Eastern Railway through Pickering, Oshawa and Bowmanville, for electrical operation, provided the town of Pickering passes a by-law guaranteeing bonds to finance the project.

WINDEGO, ONT.—Plans are being prepared by the Windego Power Company for the construction of a power plant in Windego. Sutcliffe & Neelands of New Liskeard are engineers.

WINDSOR, ONT.—The Fisher Body Company of Detroit, Mich., is planning to erect a factory in Windsor for the manufacture of closed automobile bodies, to cost about $350,000.

MELVILLE, SASK.—The Grand Trunk Pacific Railway Company is planning to erect an electric power station at Melville.

Miscellaneous

MANILA, P.I.—The Manila Electric Railroad & Lighting Company is offering $1,500,000 in notes the proceeds to be used for extensions and improvements.

PANAMA.—Bids will be received at the office of the general purchasing officer, the Panama Canal, Washington, D. C., until Oct. 7, for incinerator plant, telephone exchange,, metal furniture, panelboards,, outlet boxes, cable, condulets, storage batteries, etc. Blanks and further information relating to the circular (1306) may be obtained at the above office.

(Patents Issued Sept. 9, 1919)

1,315,201. RECORDING APPARATUS; Gustav F. C. Bauer, Buffalo, N. Y. App. filed Sept. 23, 1916. Electric police-alarm system.

1,315,204. ELECTRIC SWITCH; Carl Bramming, Chicago, Ill. App. filed May 3, 1917. Combined automobile lamp socket and switch.

1,315,205. THERMO-ELECTRIC COUPLE; William H. Bristol, Waterbury, Conn. App. filed Aug. 14, 1918. Utilizes inexpensive base metals.

1,315,237. EQUALIZER FOR DYNAMO-ELECTRIC MACHINES; John W. Pearson, Chicago, Ill. App. filed Aug. 25, 1917. Neutralizes inductive effects of current.

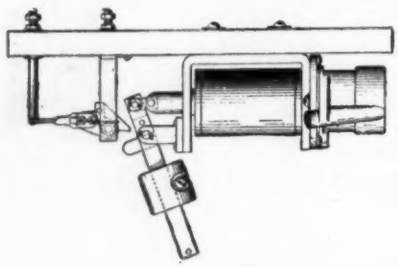
1,315,239. ELECTRIC WELDING; Robert C. Pierce and Neil Macneale, Cincinnati, Ohio. App. filed April 26, 1915. Spot welder for sheet metal.

1,315,258. ALARM CONTROLLER FOR SPRINKLER SYSTEM; Nathan H. Suren, Needham, Mass. App. filed Aug. 18, 1914. Pressure-controlled reservoir.

1,315,262. CIRCUIT CONTROLLER FOR PORTABLE ELECTRIC LIGHTS; George W. Wacker, Rutherford, N. J. App. filed May 25, 1918. Sliding contact for flashlamp.

1,315,306. ELECTRIC CONTACT DEVICE; Anders C. E. Hojgaard, Copenhagen, Denmark. App. filed March 22, 1919. Adjustable circuit-closing apparatus.

1,315,317. DEVICE FOR JOINING ELECTRICAL CONDUCTORS; Sinai Letiecq, Worcester, Mass. App. filed July 3, 1918. Junction for supplemental lines.



1,315,426—Circuit Breaker

1,315,330. DENTAL-SWITCHBOARD UNIT; James E. Reid, Moorestown, N. J. App. filed June 4, 1919. Compact and adjustable.

1,315,336. STATION INDICATOR; Edward Roscoe, Hamilton, N. Z. App. filed Dec. 11, 1916. Electric sign indicates successive stations.

1,315,337. MULTIPLE-CONTACT MICROPHONE; Wilhelm K. J. Rudolph, Kiel, Germany. App. filed Feb. 24, 1916. Microphone damping reduced.

1,315,349. TREATMENT OF ZINC-RETORT RESIDUES; Oscar Spitzer, New York, N. Y. App. filed Sept. 28, 1915. Collects metallic residues.

1,315,457. PORTABLE ELECTRIC LIGHT; Bernard Benedict, New York, N. Y. App. filed May 11, 1917. Flat flashlamp with incased mirror.

1,315,359. ELECTRIC TRANSFORMER ESPECIALLY SUITABLE FOR USE IN CONNECTION WITH ELECTRIC FURNACES; James Bibby, London, Eng. App. filed Dec. 11, 1917. Adapted to an equivalent four-phase five-wire system.

1,315,365. METHOD OF MAKING ELECTRO-MAGNETS; Peter Hamm, Milwaukee, Wis. App. filed May 20, 1914. High-tension coils, magnetos.

1,315,374. VEHICLE-THIEF-INDICATING SIGN; Patrick McCarthy, Brooklyn, N. Y. App. filed April 17, 1917. Electric front and rear signs for automobiles.

1,315,419. TRANSFORMER; Kurt Roeber, Halle-on-the-Saale, Germany. App. filed Nov. 3, 1914. Correct phase displacement obtained by current transformers with condensers.

1,315,426. CIRCUIT BREAKER; Arthur Simon, Milwaukee, Wis. App. filed May 22, 1916. Time element breaker sensitive to variations in current.

1,315,440. AUTOMATIC TELEPHONE SYSTEM; Bernard D. Willis, Chicago, Ill. App. filed May 2, 1914. Automatic connector for toll lines.

1,315,441. AUTOMATIC TELEPHONE SYSTEM; Arthur B. Smith, Evanston, Ill. App. filed May 10, 1916. Automatic calling on lines upon which phantom circuits are superimposed.

Record of Electrical Patents

Notes on United States Patents

1,315,442. AUTOMATIC TELEPHONE SYSTEM; Bernard D. Willis, Chicago, Ill. App. filed June 7, 1916. Controlling circuits for automatic switches on toll lines.

1,315,443. SEMI-AUTOMATIC TELEPHONE SYSTEM; Winfred T. Powell, Chicago, Ill. App. filed June 26, 1916. Connector switch released by subscriber that last hangs up receiver.

1,315,444. TELEPHONE SYSTEM; John Wicks, Chicago, Ill. App. filed Oct. 7, 1916. Toll trunking system for automatic long-distance calls.

1,315,445. AUTOMATIC TELEPHONE SYSTEM; Talbot G. Martin, Chicago, Ill. App. filed May 31, 1917. Repeater for use in the inter-office trunk circuits.

1,315,457. PORTABLE ELECTRIC LIGHT; Bernard Benedict, New York, N. Y. App. filed May 11, 1917. Flat flashlamp with incased mirror.

1,315,466. ELECTRIC SWITCH; John F. Cavanagh, Meriden, Conn. App. filed Oct. 25, 1918. Thermostatic-operated switch utilizing buckling-spring principle.

1,315,475. VAPORIZER; Arsene B. Des Roches, Providence, R. I. App. filed April 18, 1919. For carburetors of internal-combustion engines.

1,315,531. ELECTRIC CIRCUIT TESTER; Henning R. Sjolander, Ishpeming, Mich. App. filed Feb. 12, 1919. Ignition test and fault locater.

1,315,539. DISTORTION-CORRECTING CIRCUIT; John R. Carson, New York, N. Y. App. filed July 3, 1918. Corrects wave form of signaling impulses.

1,315,540. ELECTROCHEMICAL METHOD AND APPARATUS FOR PRODUCING SYNTHETIC ACETYLENE FROM ORGANIC LIQUID; George O. Curme, Jr., Pittsburgh, Pa. App. filed July 20, 1915. Synthesis of acetylene.

1,315,543. METHOD OF PREPARATION OF ACETALDEHYDE; George O. Curme, Jr., Pittsburgh, Pa. App. filed June 3, 1916. Combining ethylene with a mercury-salt solution in an electrolytic cell.

1,315,546. METHOD OF PREPARATION OF ACETIC ACID; George O. Curme, Jr., Pittsburgh, Pa. App. filed June 5, 1916. Anodic oxidation of ethylene in an electrolytic cell in presence of salt of mercury.

1,315,550. CABLE CONDUIT; Edwin W. Ham, Worcester, Mass. App. filed Jan. 21, 1918. Sectional conduit for holding maximum number of wires.

1,315,556. PORTABLE ELECTRIC LIGHT; Walter D. Kahn, New York, N. Y. App. filed Aug. 28, 1916. Avoids use of soldered connections; cells easily removable and replaceable.

1,315,579. RHEOSTAT; Floricel A. Rojas, New York, N. Y. App. filed Aug. 20, 1917. Compressible resistance material utilized for obtaining fine adjustments.

1,315,584. SELECTIVE RECEIVING SYSTEM FOR RADIANT ENERGY; Frederick K. Vreeland, Montclair, N. J. App. filed March 22, 1916. Prevention of interference by static effects.

1,315,590. FUSE; William C. Banks, Jersey City, N. J. App. filed Oct. 26, 1918. Tapered ends for holding fuse strip.

1,315,599. ELECTRIC SWITCH; Harry S. Freeman, Detroit, Mich. App. filed Oct. 29, 1917. Minimum space required and with increased leverage.

1,315,601. ELECTRIC CONTACT THERMOSTAT; Harry G. Geissinger, New York, N. Y. App. filed Jan. 19, 1918. Operation by deflection of the arch element.

1,315,602. ELECTRIC CONTACT THERMOSTAT; Harry G. Geissinger, New York, N. Y. App. filed Jan. 19, 1918. Circuit is opened by the lateral movement of an arch element.

1,315,603. ELECTRIC CONTACT THERMOSTAT; Harry G. Geissinger, New York, N. Y. App. filed Jan. 19, 1918. Arch element easily adjusted.

1,315,612. ELECTRIC VIBRATOR; Rude Stockinger, Manitowoc, Wis. App. filed June 25, 1918. Grounding prevented.

1,315,617. ELECTRIC REGULATING SWITCH FOR USE WITH ORDNANCE AND FOR OTHER PURPOSES; John S. Wilson, Sutton, Eng. App. filed Oct. 16, 1918. Resistance varied by observer according to height of target.

1,315,633. INSULATOR SUPPORT; George H. McFeaters, Johnstown, Pa. App. filed Nov. 7, 1918. Multiple insulator holder.

1,315,646. ELECTRICAL VIBRATOR, PARTICULARLY FOR TACHOMETERS; Herman H. Sticht, Woodhaven, N. Y. App. filed March 7, 1919. Increases range of action without increasing number of reeds.

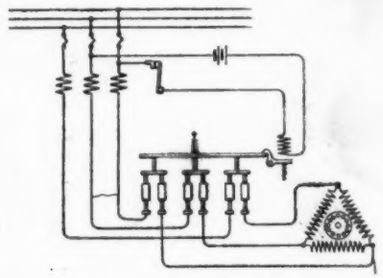
1,315,762. ELECTRIC REGULATION; John L. Creveling, New York, N. Y. App. filed Feb. 16, 1912. Generators automatically regulated and used to charge battery and operate lamps.

1,315,771. METHOD OF AND MEANS FOR CONTROLLING INDUCTION MOTORS; Henry M. Hobart, Schenectady, N. Y. App. filed March 21, 1916. For gas-electric cars or electric ship propulsion.

1,315,774. MOTOR-CONTROL SYSTEM; Benjamin W. Jones, Schenectady, N. Y. App. filed Feb. 4, 1918. For service requiring frequent reversals.

1,315,777. ELECTROMAGNETIC DEVICE; Terry T. King, Fort Wayne, Ind. App. filed Nov. 2, 1915. Responds to flux changes in the respective magnetic paths.

1,315,780. POLYPHASE RELAY; Charles B. Larzelere, Schenectady, N. Y. App. filed July 13, 1917. Opening circuit when the phases become unbalanced.



1,315,780—Polyphase Relay

1,315,781. ELECTRIC METER; Wilbur D. Le Baron, Bronx, N. Y. App. filed Dec. 14, 1917. Gives readings at opposite sides of a zero point.

1,315,785. ELECTROPLATING APPARATUS; George A. Lutz, Cranford, N. J. App. filed July 6, 1916. Rotating articles plated in electrolytic bath.

1,315,790. ELECTRICAL ENGINE-STARTING APPARATUS; Henry G. O'Neill, New York, N. Y. App. filed Sept. 21, 1915. For light automobiles.

1,315,791. RESISTANCE UNIT; Robert J. Parsons, Fort Wayne, Ind. App. filed June 10, 1918. Resistance element easily replaced and leads taken off at any point.

1,315,793. SPEED-REGULATING SYSTEM FOR MOTOR-GENERATOR SETS; William B. Potter, Schenectady, N. Y. App. filed Dec. 17, 1917. Maintains constant speed.

1,315,809. PROTECTIVE DEVICE; David Basch, Schenectady, N. Y. App. filed Oct. 13, 1917. Controlling trip coils for circuit breakers.

1,315,815. STATIONARY INDUCTION APPARATUS; Ralph H. Chadwick, Fort Wayne, Ind. App. filed Feb. 6, 1919. Provides insulating characteristics where media having different permittivities are employed between the various groups of windings.

1,315,816. POCKET FLASHLIGHT BATTERY AND BULB TESTER; Ray E. Cole, Chicago Heights, Ill. App. filed July 3, 1918. Tests dry cells and batteries.

1,315,826. ELECTRICAL SYSTEM OF POWER TRANSMISSION AND REGENERATIVE BRAKING; Peter W. Forsberg, Schenectady, N. Y. App. filed Oct. 29, 1917. Operation of generator is stable and system is protected from disturbances.

1,315,827. ELECTRICAL APPARATUS; John J. Frank, Pittsfield, Mass. App. filed April 15, 1916. Provides for readily lifting auto-transformers, reactances, etc.

1,315,830. SUBSTATION APPARATUS; Veit A. Hain, Chicago, Ill. App. filed June 23, 1916. Arrangement for the protection of rotary transformers interposed between two systems.